



DISEASES OF INFANCY AND CHILDHOOD

THEIR
DIETETIC, HYGIENIC, AND MEDICAL TREATMENT

A TEXT-BOOK DESIGNED FOR PRACTITIONERS
AND STUDENTS IN MEDICINE.

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INFECTIOUS DISEASES—CEREBRAL—ORTHOPEDIC AND
EYE, EAR, SKIN, ETC.

*WITH ONE HUNDRED AND FORTY-SEVEN TEXT ILLUSTRATIONS,
SEVERAL IN COLORS, AND FORTY-THREE FULL-PAGE
HALF-TONE AND COLOR PLATES*



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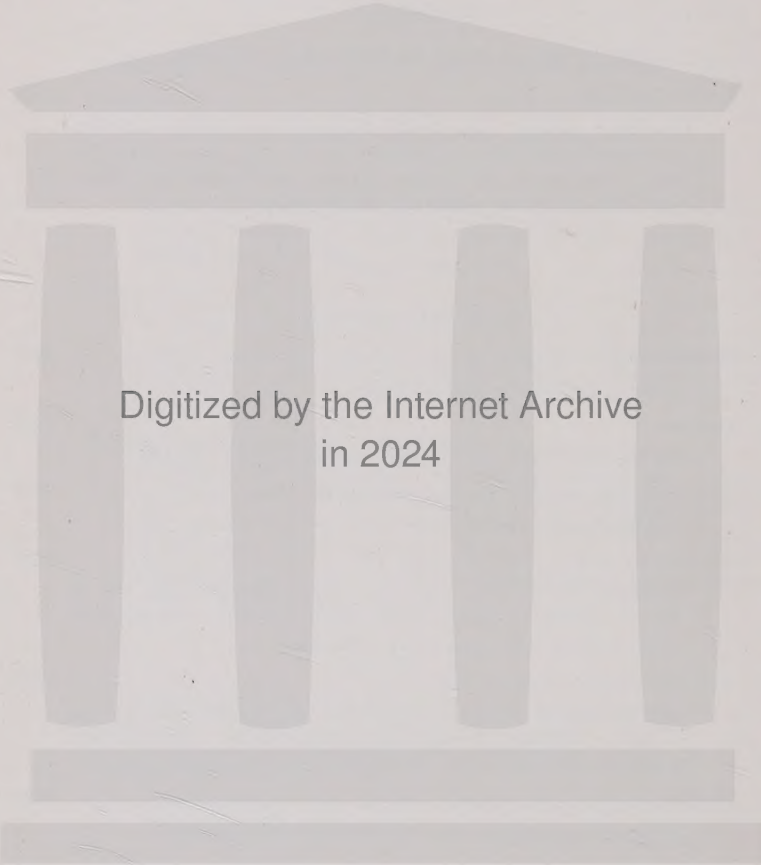
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PART VII.

I.

PERTUSSIS (WHOOPIING-COUGH).

THIS acute infectious disease is caused by a specific micro-organism, the *Bacillus pertussis* of Bordet and Gengou.

Etiology.—The catarrhal type of child with hypertrophic tonsils, and especially the child with adenoid vegetations, is more susceptible to whooping-cough. When the cervical lymph-glands are enlarged, due to an infection of the lymphatics, then this disease will enter more readily. The tuberculous child and the syphilitic child will offer less resistance to this disease than the normal child.

Poor hygienic surroundings, and living in congested districts, where sunlight and fresh air are wanting, are factors that encourage the development of this infectious disease. Statistics have proven that a child artificially fed will take this infection quicker than an infant brought up on human milk.

Bacteriology.—In 1906 Bordet and Gengou isolated a bacillus from the sputum of whooping-cough patients, but the complications of this disease are due to a mixed infection. Mallory and Hover¹ demonstrated that in pertussis there is a large accumulation of bacilli between the cilia of the respiratory epithelium, this interference with normal bacillary action hindering removal of inhaled particles, and thus depriving the lungs of their most effective means of resisting invading bacteria.

The Complement-Deviation Test.—A. Friedländer and E. A. Wagner² state that the diagnosis can be made in the catarrhal, the paroxysmal, or the convalescent stages.

Technic of Test.—A small amount of blood—about 15 to 20 drops—is taken from the patient's ear, finger, or toe in small test-tubes, or in the Wright capillary tubes. In young children the great toe is a very satisfactory place. The blood is kept at room

¹ Journal of Medical Research, Nov., 1912.

² Amer. Jour. of Dis. of Children, August, 1914.

temperature, or placed in the incubator until coagulation has taken place. Serum is then separated more completely from the clot in the centrifuge. So far in the test only fresh, active serum has been used. Two drops of the serum were used in each test.

Hemolytic System.—The Noguchi system was used because of its extreme delicacy, and because of the small amounts of material, especially serum, required. In this system washed human corpuscles, 1 drop to 4 cubic centimeters of salt water were used.

Amboceptors.—The amboceptors employed were prepared according to the Noguchi method, the serum being dried on filter-paper. The complement was obtained in the usual way from guinea-pig, dilution 1 to 40. Aside from the delicacy of this hemolytic system, it is of great value in working with children because of the very small quantity of blood required. It is not necessary to take blood from the veins, and the small quantity of blood required is easily obtained even from very young infants.

Antigen.—This is the most important factor in the test. Subcultures were made on Bordet's medium and on ascitic fluid agar exclusively and the antigens were made as follows: Seventy-two hour growths were taken. The colonies, which were very tenacious, were scraped off the agar with a glass hook into sterile salt water. An emulsion was made and the bacteria again washed in salt water. It is important to do the second washing so as to rid the emulsion of any particles of agar. From this washed emulsion a standard suspension was made, and 0.1 to 0.2 cubic centimeters of this used in the tests. Throughout the test live bacteria were used.

Controls.—In each test known normal and known positive controls were used. In each series of tests the hemolytic system was tried out in the usual manner, using a water bath at 37° C. for incubation. After primary incubation for half an hour the amount of amboceptor indicated by the preliminary test was added to our final test-tubes and the tubes again incubated in the water-bath.

In 18 cases tested during the paroxysmal stage all gave positive reactions. The reaction is not present in bronchitis.

Diagnosis.—There are three stages to this disease: First, the catarrhal stage; second, the paroxysmal or spasmodic stage; third, the stage of decline.

In the catarrhal stage we have the symptoms of an irritant cough, with no fever, no vomiting, and very little expectoration.

Such expectoration is of a glistening or glary character. The cough is severe at night, and milder during the day. As a rule, the appetite is poor, and the child shows nervous symptoms, such as irritability by day and restlessness at night. In some cases there is an intestinal catarrh associated, and the stool contains shreds of mucus.

In the spasmodic stage, usually the second or third week after an infection, the cough appears in spasms and ends in a "whoop." The cough is usually linked together and followed by a long inspiration which has a distinct "whoop." During this paroxysm the face assumes a reddish or a cyanotic appearance. Many paroxysms end in vomiting. Violent paroxysms frequently cause nose-bleeding or hemoptysis. When the paroxysms have continued for a week or more, the face assumes a characteristic puffy appearance. An intense capillary congestion will frequently be seen on the skin and also by an examination of the conjunctival mucous membrane.

The paroxysmal stage may last from four to ten weeks, although I have seen severe cases in which a distinct "whoop" continued for six months. It is a good plan to count the number of paroxysms in twenty-four hours, and by comparison with the previous week we can judge of improvement, if the frequency of the spasm is lessened. Not infrequently 20 to 50 paroxysms may occur in twenty-four hours.

During a severe paroxysm the forcible pushing forward of the tongue stretches the frenum and brings it into contact with the teeth, frequently resulting in ulceration.

The symptoms of the third stage, or stage of decline, correspond to those of the first stage, although there is extreme exhaustion from the force and frequency of the cough. From the inanition due to the vomiting and the loss of sleep caused by the paroxysmal cough, cardiac weakness must be expected. The heart sounds are feeble and muffled. A systolic blowing murmur is usually heard at the apex and may remain for many months. The pulse is small, has low tension, and is frequently irregular, owing to the heart strain. Owing to the disturbance of the circulation, in addition to the inanition, cold extremities are usually noted.

Differential Diagnosis.—In the early stage of pertussis it is quite difficult to differentiate it from bronchitis. An examination of the blood should be made, and if a marked lymphocytosis is

present then the diagnosis is positive. If the cough is paroxysmal in character and most frequent at night we should suspect pertussis.

The frequency of the cough and the intensity of the spasm, which grows worse from day to day, is characteristic of whooping-cough. When a child with pertussis is taken into the fresh air the spasms as a rule are less marked.

If a child has been exposed to a case of whooping-cough, after fourteen days have elapsed and no cough has developed, we can consider the child free from infection.

In New York City children suffering from whooping-cough are excluded from school until the whoop has entirely disappeared, which, generally speaking, means from six weeks to two months.

Complications.—The most frequent complication seen by me is bronchopneumonia. The prolonged duration of the cough and the bronchopneumonia frequently end in tuberculosis. Pleurisy with or without effusion is occasionally encountered. Atelectasis involving one or more lobes of the lung is occasionally seen in rickety children. The heart suffers because it is subjected to a severe strain. An irregular or intermitting pulse may frequently be noted because of the exhaustion from the frequency of the spells, the inanition resulting from vomiting, and the loss of sleep due to the cough. Emphysema is occasionally met with. Asphyxia is one of the dangers during continued paroxysms. When convulsions occur during the course of this disease the outcome is usually fatal. Paralysis has been described after a severe paroxysm. Such paralysis may be due to an intracranial hemorrhage. The frequency of hemorrhage from violent coughing paroxysms is one of the great dangers of this disease. Epistaxis is quite common. The sclera of both eyes is the seat of frequent hemorrhages. Hemoptysis and hematemesis are frequently noted. Cerebral hemorrhage resulting in unilateral or bilateral paralysis is occasionally met with. Hemiplegia or paraplegia following pertussis must be looked upon as a very grave complication, although not necessarily fatal. Strabismus has been reported in this disease following a severe cerebral hemorrhage. Loss of vision and partial or complete aphasia have been reported. Hematuria with and without nephritis is occasionally met with during the course of this disease. The functional derangement of the kidneys may be due to the long duration of the

disease. Glycosuria which persisted more than two years has been seen by me.

Prognosis and Course.—The outcome of any case depends on three factors: First, the proper nutrition of the body by frequent feeding. If food is ejected, the intervals of feeding must be lessened and the quantity at each feeding reduced. Second, the amount of rest obtained to restore the exhaustion from the violent coughing. Third, the prevention, if possible, of complications. If complications exist, such as an empyema, treatment should be instituted as though it were not a case of pertussis.

The course of the disease can be shortened by supporting the strength of the body with food and by aiding nature in securing rest at night.

Treatment.—*Medicinal.*—There is no specific in the treatment of this disease. Phenacetin 2 to 5 grains, or antipyrin in the same dosage, repeated every two hours until relief is afforded, will modify the cough. For relief at night codein should be given liberally; $\frac{1}{8}$ grain gradually increased to $\frac{1}{4}$ grain may be given to a child 2 to 5 years old, and repeated every two to three hours until the cough lessens. Cautiously given, the dose of codein may gradually be increased until $\frac{1}{2}$ to $\frac{3}{4}$ grain per dose is given. No systemic disturbance will be noted.

Another valuable drug is sulphate of morphia; no more than $\frac{1}{30}$ grain increased to $\frac{1}{16}$ grain should be given every four hours to a child 2 to 5 years old. Great care should be exercised and the nurse invariably cautioned regarding the dangers of this drug.

If sleep is disturbed and the cough is severe, 5 to 10 grains of sodium bromide combined with 2 to 3 grains of chloral hydrate may be repeated every three hours.

Tussol, phenocoll, lactophenin, euchinine, pasterin, and anti-spasmin are drugs recommended by enthusiasts. They have been tried by me with indifferent results; in some cases they are of value, but in most cases useless.

Bromoform has served in very many cases, sometimes with marked benefit; in other cases no benefit was noted. The dose of bromoform is from 2 to 5 drops in syrup, three times a day. Belladonna and atropin have their advocates. Owing to the extreme dryness and the erythematous flush following the administration of belladonna, it must be used with caution. My results do not warrant recommending the same. Dionin (Merck), in

doses of $\frac{1}{50}$ to $\frac{1}{25}$ grain, cautiously increased, may be given every three hours to a 2-year-old child.

To relieve the distress caused by coughing paroxysms, an abdominal support, very snug fitting, affords relief. In like manner a plaster bandage snugly applied around the ribs will give additional support to the thorax and frequently modify intense paroxysms. Strips of belladonna plaster encircling the chest may do some good. Such plaster may be left in position from several days to one week.

The injection of a vaccine prepared from the Bordet bacillus made by G. H. Sherman has many advocates. My own experience with vaccine is not encouraging.

Fresh Air.—The spasms can be shortened by keeping the child in the open air; the roof is the best place in a city. Such open-air treatment can be continued night and day during the mild weather. During stormy weather the windows should be kept wide open. In winter, with the body properly clad, the fresh, cool air will do more to restore the child's health than all drugs combined.

Food.—During the spasmodic stage the child's nutrition is lessened because of frequent vomiting. Small meals at frequent intervals are indicated. Yolk of egg in milk or orange juice, calf's foot or chicken jelly, raw scraped beef, custard, buttermilk, cheese, and ice-cream should form the bulk of the diet. My plan is to feed a portion of one or two of the above-named foods every two or three hours, thus giving ample nutrition.

Restoratives.—After the spasmodic stage subsides and the cough is lessened, Fowler's solution, 2 to 5 drops, should be given three times a day. Codliver oil, each teaspoonful containing $\frac{1}{200}$ grain of phosphorus, should be given three times a day after meals. If the oil is well borne it should be continued throughout the winter for several months.

*Local Treatment.*¹—Local treatment consisting of a 4 per cent. aqueous antipyrin solution was used in a series of acute pertussis cases in the catarrhal stage. The force of the cough was improved, the frequency lessened, and the medication seemed to exert a palliative effect. It would be difficult to state that the spasmodic stage was prevented, but I am convinced that in many of these cases the disease was aborted.

¹ YANKAUER: The Laryngoscope, August, 1907.

Regarding the spasmodic stage there is a soothing local effect manifested, but there is no specific virtue which I have experienced in a large series of cases at the Willard Parker Hospital and in quite a few cases in my private practice.

To spray the epiglottis or the posterior pharyngeal wall is useless. When the spray by the intra-laryngeal method is thrown into the larynx it exerts its beneficial effect and not otherwise. The treatment is by no means easy, and although I have shown the method to many physicians I am not sure that one of them accomplished the object sought. One skilled in intubation or laryngeal treatment should use the method when indicated.

We should not relax in giving the patient the benefit of outdoor life, sleeping porch if possible, and feeding sufficient restorative food to maintain the patient's vitality.

II.

DIPHTHERIA.

DIPHTHERIA is an acute infectious disease caused by the invasion of a specific micro-organism known as the Klebs-Löffler bacillus.

It is a disease characterized by the presence, locally, of false membranes, known as pseudomembranes. Macroscopically it is impossible to differentiate the pseudomembrane caused by the Klebs-Löffler bacillus from the one caused by the streptococcus.

Bacteriology.—Klebs and Löffler in 1883 and 1884 published their classic treatise on the diagnostic importance of the bacillus which bears their name. As proof that the Klebs-Löffler bacillus is responsible for the presence of the pseudomembrane these investigators were able to reproduce the disease by inoculating bacilli into the abraded mucous membrane of susceptible animals and develop diphtheria. Death was usually preceded by paralysis.

Löffler found the bacillus described by Klebs in most, but not all cases of throat inflammation which have been diagnosed as diphtheria. He separated these bacilli from the other bacteria present and obtained them in pure culture. When he inoculated these bacilli upon the abraded mucous membrane of susceptible animals pseudomembranes were produced and frequently death followed. If a certain amount of a bouillon culture was injected subcutaneously into guinea pigs, death was caused with characteristic lesions. Löffler's failure to find the bacillus in every case examined is now explained by the fact that certain varieties of pseudomembranous inflammation caused by the streptococcus, such as occur especially in scarlet fever, were then wrongly considered to be true diphtheria.

Welch in an address on diphtheria said: All the conditions have been fulfilled for diphtheria which are necessary to the most rigid proof of the dependence of an infectious disease upon a given micro-organism, *viz.*: the constant presence of this organism in the lesions of the disease, the isolation of the organism in pure culture, the reproduction of the disease by inoculation of pure cultures, the similar distribution of the organism in the experimental and the natural disease. In view of these facts we

must agree with Prudden that we are now justified in saying that the name diphtheria, or at least primary diphtheria, should be applied, and exclusively applied, to the acute infectious disease usually associated with pseudomembranous affections of the mucous membrane which is primarily caused by the *Bacillus diphtheriæ* of Löffler.

The bacillus can frequently be transmitted through animals. Cows, cats, dogs and pigeons having diphtheria can easily infect those coming in contact with them. Cows' milk can transmit the disease if the Klebs-Löffler bacillus exists therein.

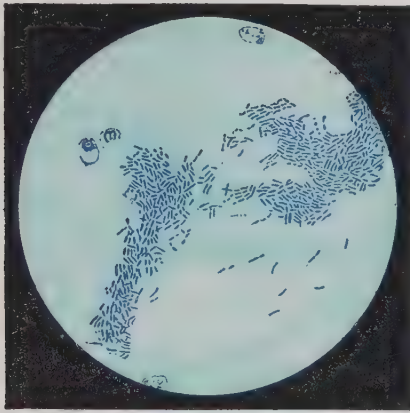


Fig. 147.—Diphtheria or Klebs-Löffler bacilli; smear preparation from tonsillar deposit. Löffler stain. $\times 800$. (Lenhartz-Brooks.)

Characteristics of the Löffler Bacillus.—The diameter of the bacilli varies from 0.3 to 0.8 micro-millimeter, and the length from 1.5 to 6.5 micro-millimeters. They occur singly and in pairs, and very infrequently in chains of three or four. The rods are straight or slightly curved, and usually are not uniformly cylindrical throughout their entire length, but are swollen at the ends, or pointed at the ends and swollen in the middle portion. Even from the same culture different bacilli vary greatly in their shape and size. The two bacilli of a pair may lie with their long diameter in the same axis, or at an obtuse or an acute angle. The bacilli possess no spores, but have in them highly refractile bodies. They stain readily with the ordinary aniline dyes and retain their color after staining by Gram's method. With an alkaline solution of methylene blue, the bacilli, from blood serum

especially, and from other media less constantly, stain in an irregular and extremely characteristic way, namely, club-shaped.

The bacilli do not stain uniformly. Certain oval bodies situated in the ends, or in the central portions, stain much more intensely than the rest of the bacillus. Sometimes these highly stained bodies are thicker than the rest of the bacillus; again, they are thinner and surrounded by a more slightly stained portion. The bacilli seem to stain in this peculiar way at a certain period in their growth, so that only a portion of the organisms taken from a culture at any one time will show the characteristic staining. In old cultures it is often difficult to stain the bacilli, and the staining, when it does occur, is frequently not at all characteristic.

Growth on Blood Serum.—If we examine the growth of the diphtheria bacillus in pure culture on blood serum, we will find at the end of ten to twelve hours little colonies of bacilli, which appear as pearl-gray or whitish-gray, slightly raised points. The colonies when separated from each other may increase in forty-eight hours, so that the diameter may be $\frac{1}{4}$ inch. The borders are usually somewhat uneven. These colonies, lying together, fuse into one mass, especially if the serum is rather moist. During the first twelve hours, the colonies of the diphtheria bacilli are about equal in size with those of the streptococci; but after this time the diphtheria colonies become larger than those of the streptococci, nearly equaling those of the staphylococci.

The Relation Between the Length of the Bacillus and its Virulence.—Some investigators believed that the degree of virulence possessed by the diphtheria bacilli could, to a certain extent, be judged by their length. The longest bacilli were supposed to be the most virulent; those of medium length less so, and the shortest, little if at all virulent. By observing this characteristic it was thought cultures might become helpful in prognosis.

The short Klebs-Löffler bacillus apparently produces a toxin of greater virulency than the larger forms, although the local manifestations may not be so extensive.

The long Klebs-Löffler bacillus and the streptococci, when found alone, give rise to a mild type of the disease.

The streptococcus is found associated with Klebs-Löffler bacillus in most severe cases. Its special significance is not so clear, but it is possible that by causing a more intense inflammatory reaction it opens avenues by which the toxins of the Klebs-

Löffler bacillus, plus its own toxin, may find more ready entrance into the circulation.

The apparent beneficial action of the antitoxin of the Klebs-

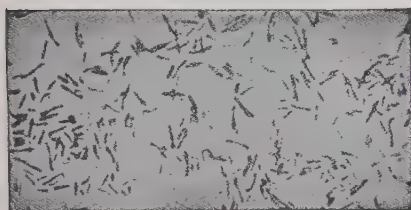
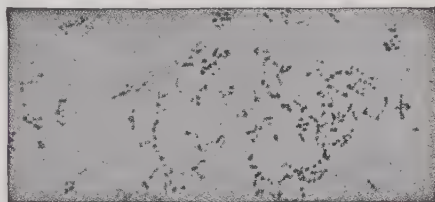
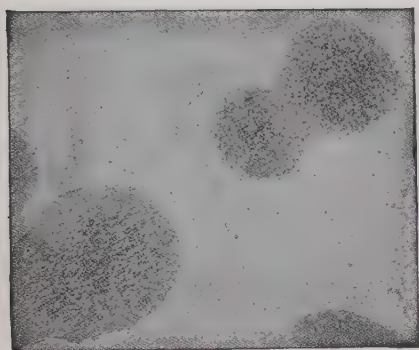
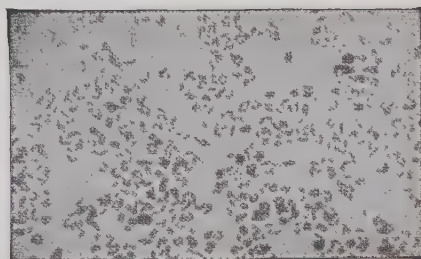
*a**b**c**d**e**f*

Fig. 148.—True and false diphtheria. (a) Diphtheria bacilli $\times 100$. (b) Characteristic diphtheria bacilli $\times 1000$. (c) Colonies of diphtheria bacilli $\times 124$. (d) Even-stained short diphtheria bacilli $\times 1000$. (e) Pseudo-diphtheria bacilli $\times 1000$. (f) Streptococci smeared directly upon cover glass from throat exudate $\times 1000$. (After Park.)

Löffler bacillus in cases where this bacillus is not present may be due to the fact that though the local action of the different

microbes varies to a considerable extent, the action of their toxins, as is shown by the similarity of the constitutional symptoms produced by them, presents many kindred features. The thought therefore arises that the antitoxin of one infection may have an inhibitory effect on the toxin of another.

Very careful notes have been made on this point in the examination of the bacteria from the original serum tubes in the following 1613 cases:—

TABLE No. 41.

| | No. of Cases. | Mortality. |
|---|---------------|--------------|
| Bacilli of average size found in | 1398 | 26 per cent. |
| Bacilli longer than average in | 82 | 27 per cent. |
| Bacilli shorter than average in | 67 | 35 per cent. |
| Bacilli short, not characteristic in shape and evenly stained, of which many were pseudo-diphtheria bacilli | 66 | 12 per cent. |
| Number of cases examined | 1613 | |

The results obtained from this examination of 1613 cultures, therefore, indicate that in New York the great majority of cases of diphtheria yield in cultures bacilli of medium size which are characteristic in shape and manner of staining. In a moderate number of cases the bacilli found are much longer, and in about an equal number they are much shorter. Both the clinical histories and the animal experiments show that whenever in their shape and in the way in which they take the staining fluid the bacilli are characteristic, no information as to their virulence, either in men or animals, can be gathered from their length. Those bacilli, on the other hand, which are short and stain uniformly with methylene blue usually prove to be of the pseudo-diphtheria type, and have no virulence in animals.

Etiology.—The mouth, throat, and especially the tonsils frequently harbor the Klebs-Löffler bacillus. When this micro-organism is present it may lie dormant until vitality is lowered. If resistance is lessened, by chilling of the surface of the body, a gastric disturbance or a fever, then infection can take place.

This disease is primarily a children's disease, and is most frequently met with between the fourth and eleventh years,

whereas younger children and older children seem to be less susceptible.

Many infants under one year have been seen by me during my service at the Willard Parker Hospital. As a rule this infection is more frequently met with in the artificially fed infant, less frequently during maternal feeding.

Baginsky reports a series of cases in which:—

84 occurred during the first year.
 889 between the first and fourth year.
 1411 between the fourth and tenth year.
 318 between the tenth and fourteenth year.

These statistics are in accord with those seen at the Willard Parker Hospital.

TABLE NO. 42.—WILLARD PARKER HOSPITAL—DIPHTHERIA.
 1915-1920.

| Year. | Admitted. | Discharged. | Died. | Mortality In- cluding 48- Hour Cases. |
|-------|-----------|-------------|-------|---|
| 1915 | 1854 | 1537 | 261 | 14.5 |
| 1916 | 1429 | 1070 | 203 | 14.9 |
| 1917 | 1655 | 1323 | 271 | 17.0 |
| 1918 | 2571 | 2119 | 345 | 14.0 |
| 1919 | 2164 | 1698 | 405 | 19.2 |
| 1920 | 1718 | 1388 | 256 | 15.6 |

Pneumonia Complications.

1919 Percentage
 3.5

1920 Percentage
 9.5

Pathology.—The pathological lesions are caused by the specific action of the Klebs-Löffler bacillus and the associated pathogenic bacteria. In addition thereto the toxins generated by the various micro-organisms produce local destructive changes.

As a rule, the local pathological lesion is a whitish, yellowish-white, or grayish-white membrane, which is firmly adherent. In some instances a distinct greenish or black color (gangrenous type) is evident.

In a study of the pathology of 220 fatal cases of diphtheria by Mallory, Councilman, and Pearce they found two varieties of membrane; first, a dense, firm, elastic membrane composed of a reticular structure with considerable uniformity in the size of

the beams composing it. This membrane can be stripped off in large flakes. Second, a more friable variety composed of fibrin forming a reticulum with more irregular spaces and fibers. The fibrin spaces contain leucocytes, amongst which are found some broken down cells (detritus). The epithelium below the membrane contains polynuclear leucocytes and lymphocytes.

The interval lesions of diphtheria are those resulting from degenerative changes affecting organic structures. As a rule, hemorrhages are found in addition to marked degeneration. The lymph nodes are usually swollen and contain small foci of cell-necrosis. Bronchopneumonia, if present, shows the usual lesions common to this condition. The nervous system, heart, spleen, lungs, and liver show the most destructive effect of the toxins of diphtheria.

Symptoms.—On one or both tonsils a yellowish or greenish-yellow membrane will be seen. There is a necrotic odor from the breath. This diphtheritic odor is characteristic and is not present in tonsillitis. The uvula is intensely congested and may be covered with a membrane. The pharynx is usually the site of a membrane. There is a loss of appetite and the bowels are, as a rule, constipated. The pulse ranges between 100 and 130, the respiration is not markedly increased. If the respiration is increased in frequency then the thorax should be carefully examined for a bronchial or pulmonary complication.

The submaxillary glands are usually swollen, there is marked prostration. The child appears to be toxically ill.

Unless antitoxin is injected the following symptoms will develop: Marked prostration, cold extremities, excessive cold clammy perspiration and irregular pulse, at times intermittent, while in some cases it will be very slow (bradycardia). In another series of cases the pulse will be accelerated and there will be gallop-rhythm. Systolic murmurs will usually be heard at the apex.

The temperature will rise to 103°, 104° or 105° F., whereas, in other cases it will not rise above 100° F., or may even be sub-normal. The cervical glands will enlarge, the breath will have a fetid odor, the tongue will be dry and glazed. The pharynx is also dry. Intense thirst is always present. If toxemia is present it usually adds to the gravity of the case. The urine is high colored and diminished in quantity. It contains albumin, red blood-cells, and in some cases casts. When toxic nephritis



Fig. 149.—Section from an inflamed uvula covered with a stratified fibrinous membrane, from a case of diphtheritic croup of the pharyngeal organs (Müller's fluid, hematoxylin, eosin). (a) Surface layer of coagulum, consisting of epithelial plates and fibrin and containing numerous colonies of cocci. (b) Second layer of coagulum, consisting of fine-meshed fibrin network enclosing leucocytes. (c) Third layer of coagulum, lying upon the connective tissue, and consisting of a wide meshed reticulum of fibrin enclosing leucocytes. (d) Connective tissue infiltrated with cells. (e) Infiltrated boundary layer of the connective tissue of the mucous membrane. (f) Heaps of red blood-cells. (g) Widely dilated blood-vessels. (h) Dilated lymph-vessels filled with fluid, fibrin, and leucocytes. (i) Duct of a mucous gland distended with secretion. (k) Transverse section of a gland. (l) Fibrin reticulum in the superficial layer of connective tissue. $\times 45$. (Ziegler.)

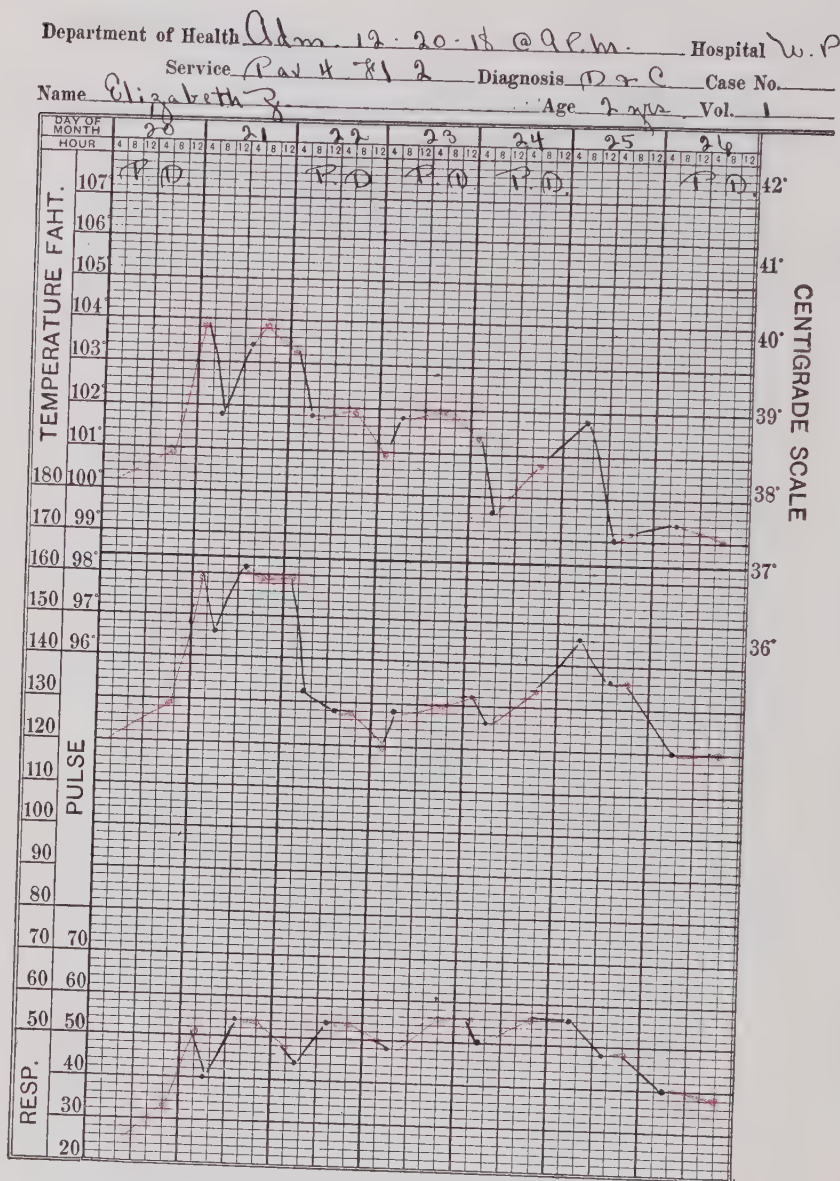
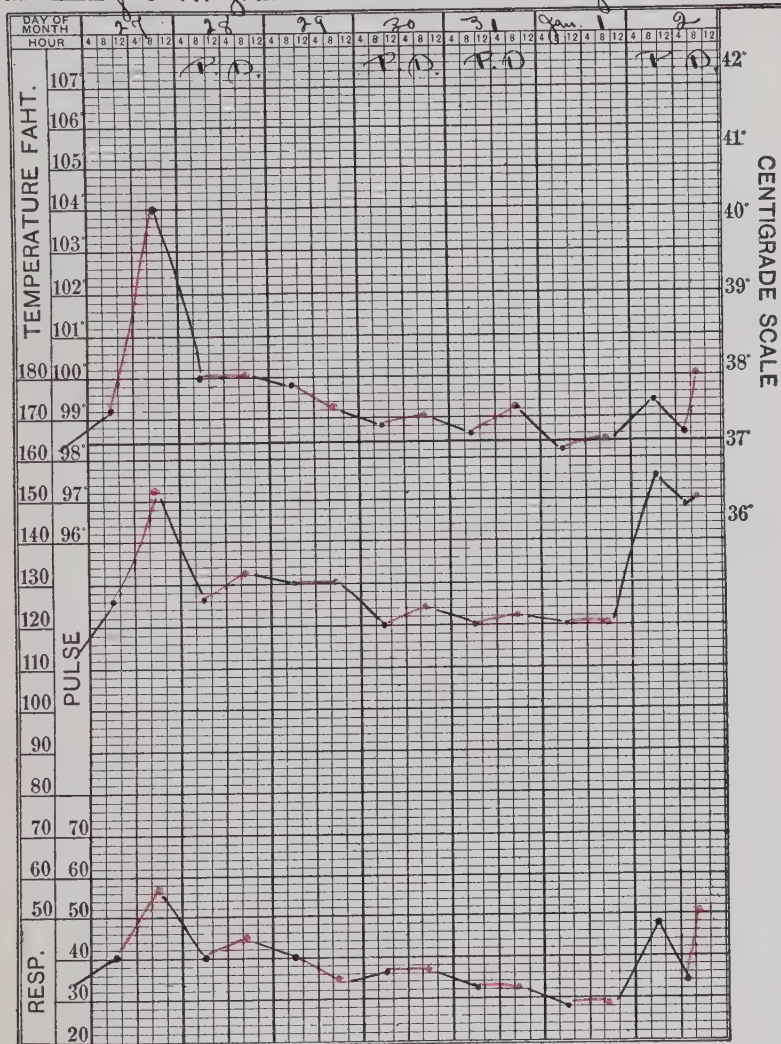


Fig. 150.—Diphtheria. Elizabeth Z. Age, 2 years. Extensive exudate on both tonsils, the uvula, and pharynx. Croupy cough. Three days ill on admission to the Willard Parker Hospital. Received 20,000 units antitoxin.

Department of Health Adm. 12-20-18 @ 9 P.M. Hospital W. P.
 Service Res. iv 81. 2 Diagnosis D. & C. Case No.
 Name Elizabeth B. Age 2 yrs. Vol. II



Continuation of Fig. 150.

complicates, convulsions frequently occur. Unless elimination of toxins through the skin, kidneys, and bowels takes place, the prognosis is grave.

Varieties of Diphtheria.—In the lacunæ of the tonsils membranous patches can be seen which clinically resemble follicular tonsillitis. A culture can always differentiate the two diseases. One of my cases at the Willard Parker Hospital showed a large membranous exudate on the tonsil while the opposing tonsil had a follicular form of diphtheria (see Frontispiece, Vol. I). This is frequently called *lacunar diphtheria*.

CASE IV.—Elizabeth Z., 2 years old, was admitted to the Willard Parker Hospital January, 1919. There was an extensive exudate on both tonsils, the uvula, and pharynx. The temperature was 104°, pulse 150, respiration 56. Diminished resonance on percussion in small areas over both lungs. Broncho-vesicular breathing, and many râles. Prognosis bad. One week later the temperature became normal, pulse 156, respiration 50. Palatine paralysis caused regurgitation of fluids through the nose and mouth. Case recovered.

CASE V.—Pauline H., 10 years old, was ill three days on admission to the Willard Parker Hospital with an exudate on both tonsils—follicular type on left. Temperature 101°, pulse 130, respiration 28. Five thousand units of antitoxin were given intravenously. Two days later the temperature became normal, pulse 100, respiration 26. The child made an uneventful recovery, with no complications.

CASE VI.—Anthony L., 21 months old, was ill six days on admission to the Willard Parker Hospital. A severe sepsis with extensive exudate involving the whole of the visible pharynx, tonsils, and uvula. The nose also was plugged with membranes. There was a marked necrotic odor. Prognosis fatal. Temperature on admission was 103°, two days later it rose to 107°, and later to 107½°, respiration 74, pulse 160. Exitus on the third day.

The blood count on admission showed: White cells 11,600, polynuclear 69 per cent., lymphocytes 19 per cent., mononuclear 6 per cent., eosinophiles 1 per cent., myelocytes 5 per cent. The low leucocyte count showed poor resistance.

I am indebted to Thompson and Von Bose for records and clinical histories of cases cited.

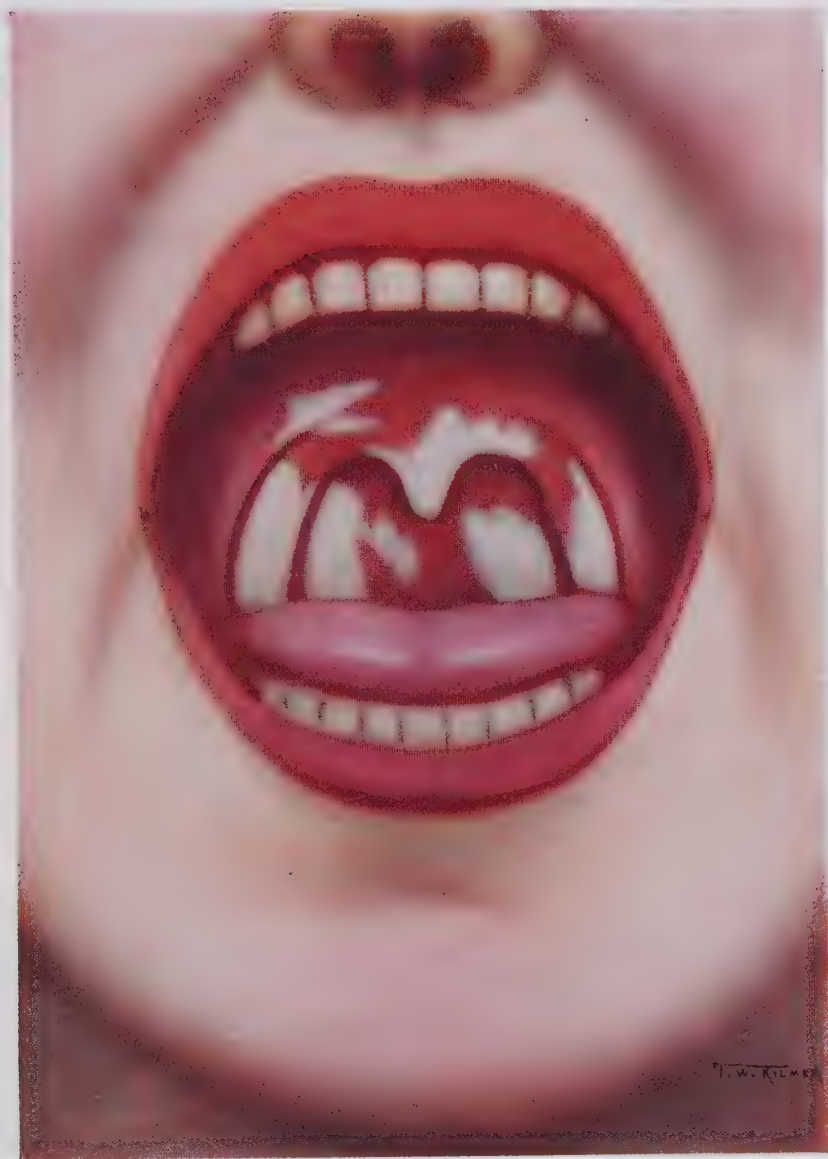
Tonsillar Diphtheria.—The type most frequently met with is tonsillar diphtheria. Very small or very large patches will be present but they are no indication as to the amount of toxemia present.

PLATE XXXVIII



Diphtheria. A mild form of exudate, involving both tonsils and the uvula. The pharynx is normal. Received 5000 units of antitoxin.

PLATE XXXIX



Diphtheria. Extensive exudate on both tonsils, the uvula, and pharynx. Croupy cough. Child two years old. Three days ill on admission to the Willard Parker Hospital. Received 20,000 units antitoxin.

PLATE XL



Septic diphtheria. Extensive exudate involving the pharyngeal wall, tonsils and uvula. Six days ill on admission to the Willard Parker Hospital. Croupy cough. Diminished respiratory murmur and cyanosis showing deficient oxygenation. Cervical glands enlarged. Received 20,000 units antitoxin intravenously.

Department of Health Adm. 1-8-19 W.P. Hospital
 Service Pat. IV 81 II Diagnosis Diph. Case No. _____
 Name Pauline H Age 10 yrs. Vol. I

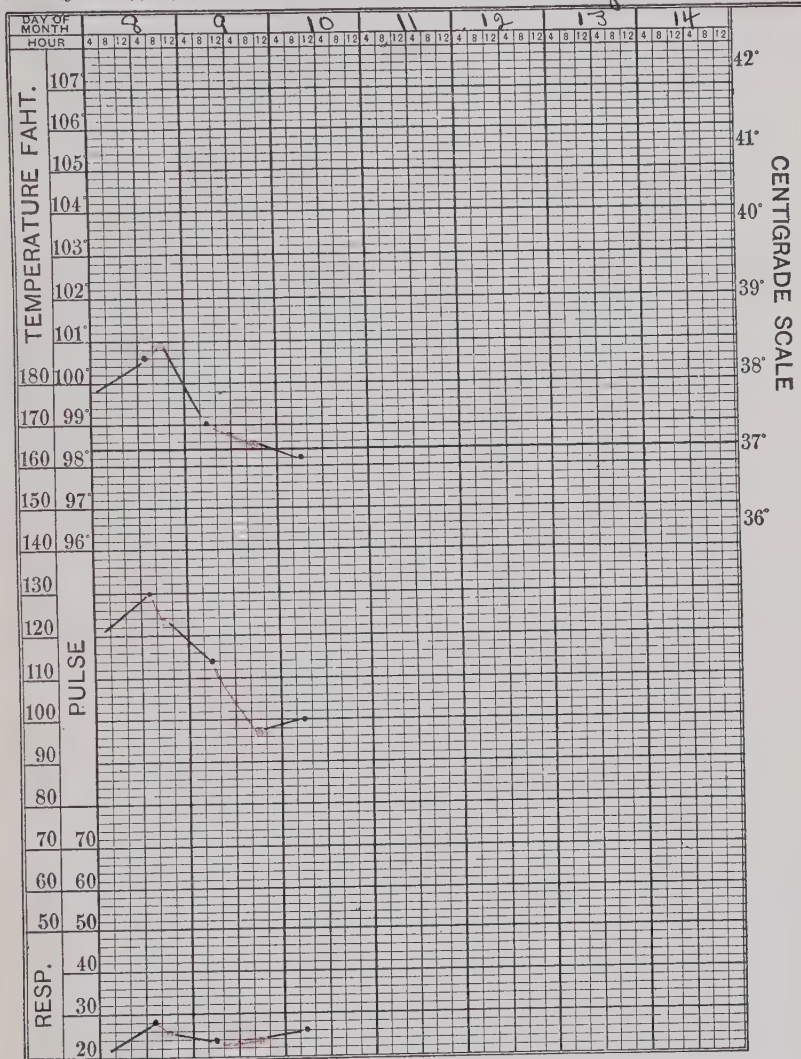


Fig. 151.—Pauline H. Age, 10 years. Diphtheria. A mild form of exudate involving both tonsils and the uvula. The pharynx is normal. Received 5000 units of antitoxin.

Pharyngeal Diphtheria.—This form is commonly met with and is a very serious form owing to the tendency to spread upward into the nose or downward into the larynx.

When large masses of pseudomembranes are present there is usually marked prostration, fever and glandular swelling associated. The danger of infecting the Eustachian tube through the post-pharyngeal wall should always be remembered.

Uvular Diphtheria.—This is not a dangerous form of diphtheria if limited to the uvula. It usually accompanies the infection of the adjacent tissues.

Laryngeal Diphtheria.—Laryngeal diphtheria is by far the most serious form of diphtheria. The diagnosis cannot be made by direct inspection as the larynx lies too low and is covered by the epiglottis. A laryngeal mirror must be used.

There is usually a croupy, barking cough which indicates laryngeal obstruction or stenosis. The danger in laryngeal stenosis is the extension of the infection to the trachea and bronchi thus setting up a diphtheritic pneumonia.

Nasal Diphtheria.—When diphtheria infects the nostrils it should always be looked upon as a serious condition. It is impossible to see the amount of pseudomembrane on the anterior or posterior nares.

There is always a profound toxemia associated with nasal diphtheria. This is due to the large amount of lymphoid tissue in the nasopharynx. Unless the toxin is destroyed early in the disease cardiac paralysis may follow. Nasal diphtheria should always be treated as vigorously as laryngeal diphtheria.

Hemorrhagic Type.—In the hemorrhagic type we usually have epistaxis and the pharynx is the seat of continuous oozing of blood. The exfoliating of small or large pieces of membrane is immediately followed by bleeding.

Septic Type. Another and a fatal form of diphtheria is the septic type. Such children have a yellowish tinge to the skin, appear exsanguinated, with cold extremities, cold clammy perspiration, dry tongue and lips resembling a typhoid state, the pulse thready, irregular and increased in frequency. The prognosis is fatal if seen late in the disease. Most of these cases will give a history of at least one or two weeks illness before coming for treatment.

Diagnosis.—If a membranous exudate is present on the tonsils and pharynx, with a foul-smelling discharge (gangrenous odor) and if the cervical glands are enlarged, then the diagnosis of diph-

PLATE XLI



Nasal diphtheria. Note excoriation of the nostrils and membranous secretion. The left nostril is partly occluded. As a rule such cases show involvement of the rhinopharynx, although many of the cases show the diphtheritic infection in the anterior nares.

PLATE XLII



Nasal diphtheria. Showing nasal hemorrhage following exfoliation of the membrane. This child also had an exudate on both tonsils and pharynx. Note the glandular swelling on both sides of the neck. These cases end fatally unless antitoxin is injected intravenously.

Department of Health Adm 12/27/18 WILLARD PARKER HOSPITAL
 Service Par 4-2 fl Diagnosis dgc Case No. _____
 Name Anthony L. Age 21 mos. Vol. T

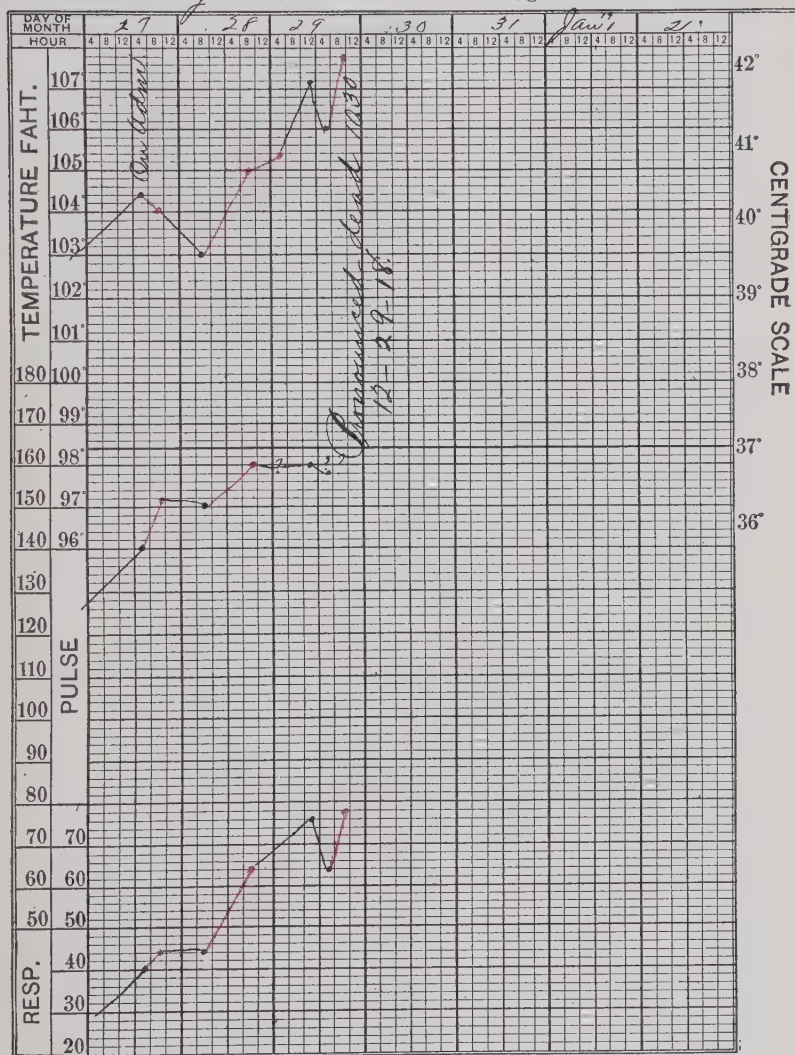


Fig. 152.—Septic diphtheria. Anthony L. Age 21 months. Extensive exudate involving the pharyngeal wall, tonsils, and uvula. Six days ill on admission to the Willard Parker Hospital. Croupy cough. Diminished respiratory murmur and cyanosis showing deficient oxygenation. Cervical glands enlarged. Received 20,000 units antitoxin intravenously.

theria is justified. If croup is present even though there is no visible exudate it is safer to make a diagnosis of probable diphtheria and inject antitoxin, than to run the risk of neglecting a diphtheria.

The diagnosis of diphtheria affecting the pharynx, tonsils and nares with visible membrane is quite easily made. When, however, the disease affects the lower respiratory tract, the larynx,

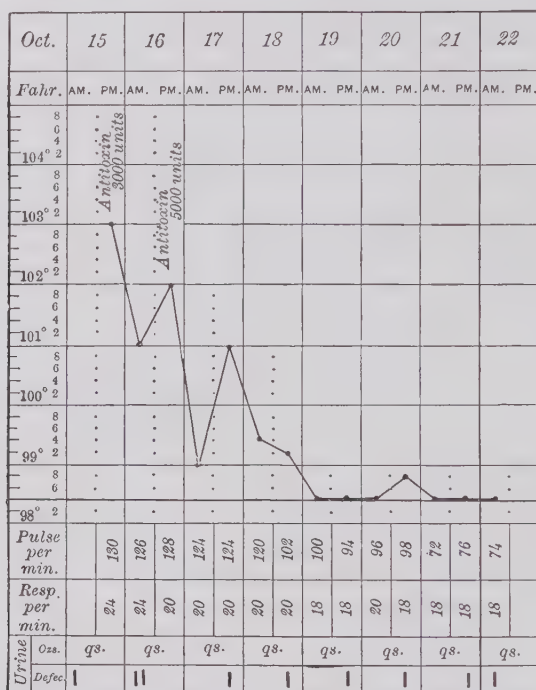


Fig. 153.—Case of nasal diphtheria. Willard Parker Hospital. Injected with 3000 units of antitoxin on the 15th, and 5000 on the 17th.

trachea, or bronchi the diagnosis will be rendered more difficult. The crucial test consists in taking a culture and noting the bacteriological result. The presence of the Klebs-Löffler bacillus means diphtheria, especially if the glands of the neck are swollen. Laryngeal cultures cannot be relied upon. Unless one is skilled in intubation, a culture from a larynx will be next to impossible.

We must not infer that if the Klebs-Löffler bacillus is not found by culture, our case is of non-diphtheritic character. A technical error such as swabbing a healthy surface instead of an infected

area, may be the cause of a negative result. *Not infrequently in the most malignant forms of diphtheria nothing but a streptococcus can be found. This is especially true when complications such as broncho-pneumonia are met with.*

Out of 1857 cases of diphtheria admitted to the Willard Parker hospital during one year, 426 showed negative cultures

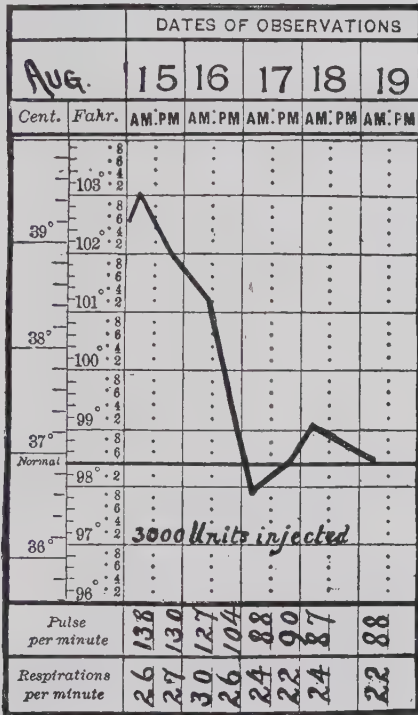


Fig. 154.—Note rise of temperature after injection of antitoxin and the specific effect, the following day, on temperature and pulse.

on admission, and 1431 showed positive cultures on admission. The total number of croup cases admitted was 403.

533 cases showed tonsillar exudate.

348 cases showed laryngeal exudate.

160 cases showed tonsillar and pharyngeal exudate.

39 cases showed tonsillar, pharyngeal, and nasal exudate.

36 cases showed pharyngeal exudate.

23 cases showed nasal exudate.

A small apparently innocent patch on the tonsil or pharynx should be as vigorously treated as a general septic infection. In

other words the danger of a small patch extending to the larynx should not be forgotten.

Other forms of local infection are: The lips, the nose, the mucous membrane of the mouth, the tongue, the vagina, and the skin can be the seat of a diphtheritic infection. Not infrequently diphtheria affects the umbilicus. Diphtheritic ophthalmitis is ex-

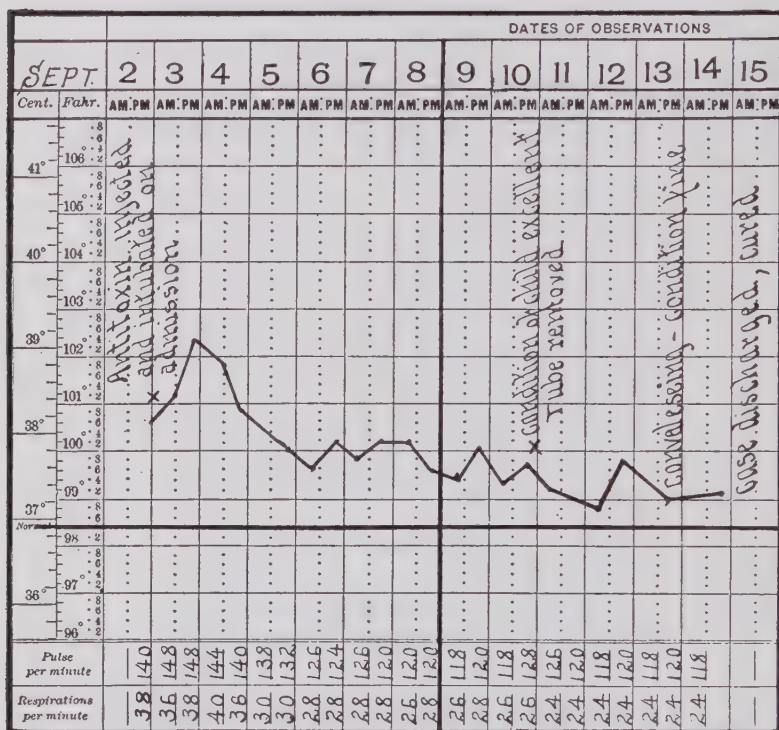


Fig. 155.—Temperature chart from a case of laryngeal diphtheria. Excellent result of intubation and antitoxin. Doubtful prognosis. Recovery.

ceedingly dangerous and frequently fatal. Rhinitis, especially in young infants, is frequently a diphtheritic process, although resembling an ordinary 'cold in the head.' The sudden appearance of croup will frequently cause a fatal termination if neglected. Occasionally petechial hemorrhage will be noted on the skin. There may also be bloody urine and hemorrhages from the nose and mouth. This has been designated as the hemorrhagic variety of diphtheria.

When the pseudomembrane exfoliates bleeding may take place but this does not necessarily imply that it is a case of hemorrhagic diphtheria.

Rashes.—Serum rashes are quite common after the injection of antitoxin. As a rule, they appear a number of days or about

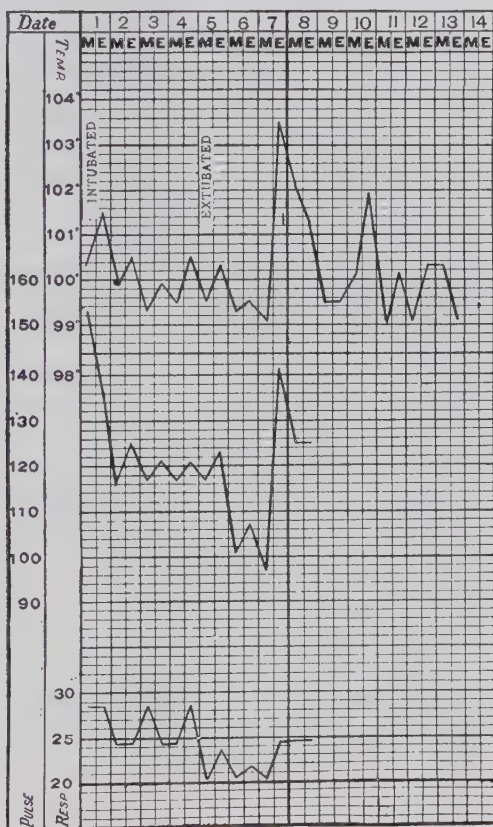


Fig. 156.—A convalescing case—normal on the fifth day after anti-toxin treatment. Two days later on seventh day of illness temperature suddenly rose, due to overfeeding. A laxative followed by a colon irrigation and liquid diet brought temperature to normal within twenty-four hours.

one week after the injection. Susceptible children with anaphylactic tendencies may show the rash within twelve hours or less, following the injection.

These rashes are more commonly of the urticarial type resembling common hives with swelling, redness, and intense itch-

ing. Less frequently the erythematous type will appear. Occasionally a punctiform type strongly resembling scarlet fever will appear.

We also meet with the morbiliform type strongly resembling measles, but the absence of the buccal enanthem and the catarrhal manifestations of the nose, throat, chest and eyes will exclude true measles.

C. Hartung quotes a number of European observers who found an antitoxin rash in 11.4 per cent. of 2661 cases. Berg found that rash in 82 cases out of 337, or 24 per cent. This condition is described in detail in Nothnagel's Encyclopedia, pages 153-162.

While Northrup reports 147 cases of rash occurring between the seventh and twelfth day, other observers report the rash as occurring much earlier. In the series above reported the largest number of rashes occurred on the second and third day after the injection. I have frequently seen an antitoxin rash several hours after the injection was given, while the majority of the rashes were fully developed on the second day. Rashes have also been seen by me several minutes after an injection of antitoxin.

Laurence S., aged 4 years, was admitted on the third day of illness, to the Willard Parker Hospital. He was in a poor condition when admitted. Was intubated about one-half hour before admission. Slight retraction was present. Membranes on right tonsil, and profuse nasal discharge.

The physical examination was negative, the heart regular and of good force; 4000 units of antitoxin were given on admission. Seven minutes after the antitoxin was injected the patient had a profuse rash all over the chest, extending from the fifth ribs to clavicles. The rash and flush were most marked in the area corresponding to the place of injection. The tongue was heavily coated. Little nourishment could be taken. The child gradually grew worse and died.

Site of the Eruption.—A large flush is frequently seen on the parts around the point of injection, from whence it spreads over the body. It is most frequently seen, however, on the abdomen, chest and buttocks. The face and neck are seldom involved. There is itching and occasionally the children complain of intense pain in the joints. Fever usually precedes the eruption.

In urticaria and other serum rashes both the itching and rash will disappear in twenty minutes to one-half hour after one subcutaneous injection of two minims of 1 to 1000 adrenaline solution.

PLATE XLIII



MORBILLIFORM ANTITOXIN RASH.

Lizzie F., 5 years old, was admitted to the Willard Parker Hospital during September. She was ill seven days before admission. Diphtheria was present on both tonsils. There was slight glandular swelling. The general systemic condition was poor. The temperature was 101° F., pulse 126, respiration 24. The child received 5000 units of antitoxin on admission, and on the following day a second injection of 4000 units. Four days after the second injection of antitoxin, the throat cleared so that no membrane was visible. Two days later, or six days after the second antitoxin injection, a universal rash appeared on the face, chest, abdomen, back, and extremities. This rash was morbilliform in character and persisted for twenty-two days, although it was chiefly confined to the arms and legs. No complications followed. The child left the hospital in excellent condition.

The differential diagnosis between true scarlet and a serum rash will be rendered difficult unless the previous history of anti-toxin injection is remembered.

The following series of 350 cases of antitoxin rashes was studied at the Willard Parker Hospital during my service, by B. Throne and will convey a good idea of the types of rashes usually found.

TABLE No. 43.

| | |
|--|-----|
| Erythematous rashes | 109 |
| Punctiform | 19 |
| Urticarial | 223 |
| Erythematous rash on face | 9 |
| Erythematous rash on buttocks | 11 |
| Erythematous rash on upper extremities | 18 |
| Erythematous rash on lower extremities | 7 |
| Erythematous rash on body | 64 |
| Punctiform rashes on body | 18 |
| Punctiform rashes on upper extremities | 1 |
| Urticarial rashes on face | 18 |
| Urticarial rashes on buttocks | 18 |
| Urticarial rashes on upper extremities | 41 |
| Urticarial rashes on lower extremities | 30 |
| Urticarial rashes on body | 128 |
| Rashes appearing on first day | 6 |
| Rashes appearing on second day | 39 |
| Rashes appearing on third day | 30 |
| Rashes appearing on fourth day | 27 |
| Rashes appearing on fifth day | 34 |
| Rashes appearing on sixth day | 35 |
| Rashes appearing on seventh day | 28 |
| Rashes appearing on eighth day | 25 |
| Rashes appearing on ninth day | 14 |
| Rashes appearing on tenth day | 12 |
| Rashes appearing on eleventh day | 1 |
| Rashes appearing on twelfth day | 4 |
| Rashes appearing on thirteenth day | 3 |
| Rashes appearing on fourteenth day | 2 |
| Rashes appearing on fifteenth day | 1 |
| Rashes appearing on sixteenth day | 2 |
| Rashes appearing on eighteenth day | 1 |
| Rashes appearing on twentieth day | 1 |
| Rashes appearing on twenty-first day | 1 |
| Rashes appearing on twenty-seventh day | 1 |

Persistence of Antitoxin Rashes.

| | |
|---------------------------------|-----|
| Rashes lasting one day | 17 |
| Rashes lasting two days | 174 |
| Rashes lasting three days | 55 |
| Rashes lasting four days | 3 |
| Rashes lasting five days | 6 |
| Rashes lasting six days | 2 |
| Rashes lasting eight days | 1 |
| Rashes lasting nine days | 1 |

Course.—Exfoliation of the membrane on the pharynx and tonsils usually follows one or two days after sufficient antitoxin has been injected. In croup with laryngeal stenosis the membrane will take somewhat longer to exfoliate if intubation has been performed. If, however, no tube is in the larynx then the exudate will exfoliate the same as in pharyngeal or tonsillar cases.

It is difficult to state the exact length of time that a child should be under observation. It depends on the condition of the heart, on the kidneys, and on the response to nutrition. My plan has been to keep a child quiet and in bed at least two weeks following the beginning of the disease. When all symptoms have disappeared, then out of doors in the sun, on a screened porch is more healthful than keeping the child in bed.

Complications.—Fever. If, after sufficient antitoxin has been injected, fever continues then the cause of the same must be looked for elsewhere.

The ears, adjacent to the throat owing to the proximity of the Eustachian tubes, should always be examined. A bulging drum, if present, should be incised. Tenderness over the mastoid should be carefully watched. The danger of neglect of a mastoiditis may mean a fatal termination.

Next in frequency to the ears are the lungs. Capillary bronchitis and bronchopneumonia are among the most frequent complications and if overlooked may end fatally.

The kidneys are very vulnerable to infection during diphtheria, hence the urine should be examined daily if fever of an unexplained cause is present.

The joints are the seat of infection in some cases of diphtheria, hence tenderness over the joints should be noted. Painful and inflamed joints are occasionally met with as a complication. Absorbent cotton or gauze saturated with oil of

wintergreen and applied directly over the tender joints will prove beneficial. In addition thereto a tight bandage seems to soothe the joint.

During convalescence in the second or third week after diphtheria, paralysis may be noted following a severe attack of diphtheria. This paralysis is the result of a toxemia. In many cases it shows that sufficient antitoxin is not present to neutralize the toxin.

There are five forms of palsy most frequently met with: palatal, ocular, cardiac, diaphragmatic and multiple neuritis.

In palatine paralysis a nasal twang will be noted, the voice is not clear. On swallowing liquids, a regurgitation through the nose will result. When the muscles of the trunk are involved emaciation results. When paralysis involves the extremities the knee-jerk may be diminished or absent, caused by change in the peripheral neuron. Such children are unable to walk or climb, they fall easily, waddle or stagger. When the sphincters of the bladder or rectum are paralyzed there will be involuntary evacuations.

When cardiac paralysis exists there is irregularity of the heart action—a gallop-rhythm or bradycardia. The systolic murmur is usually heard at the apex. There is cyanosis of the lips and finger tips, the extremities are cold. As a rule there is cold perspiration. The temperature is subnormal.

Monicatide divided diphtheritic paralysis into four groups: Those showing (1) purely muscular change without nerve involvement; (2) polyneuritis; (3) lesions of the spinal cord, which were either localized in the gray matter, leading to atrophy of muscles, or involved the white matter of the cord in a similar way to that seen in locomotor ataxia or multiple sclerosis, and (4) cerebral hemorrhage chiefly due to circulatory change. This classification is accepted by many today. To be scientifically correct, however, the fourth group, *i.e.*, the cerebral palsies, should not be classed as a palsy due to diphtheritic toxin, inasmuch as they are accidental. Strictly speaking, the term diphtheritic palsy should be applied to those palsies only which are due to direct action of the diphtheritic toxin.

A child 4 years old, was seen during my service at the Willard Parker Hospital. He had suffered with severe tonsillar and pharyngeal diphtheria. The exudate was unusually thick. The resident physician called my attention to a regurgitation of liquids through the nose and to the

nasal twang in speaking. On examining the throat all evidence of diphtheria had disappeared. The tip of the uvula, instead of hanging in the median line, pointed toward the left side. As this case was a severe type of diphtheria we were not surprised to see the paralysis. Strychnine was given. The child recovered. Three thousand units of antitoxin had been injected, and no further treatment given for ten days before the child was sent to the hospital.

The following case proves that although a child may be septic with enlarged cervical glands and have a diphtheritic exudate covering the whole of the fauces, paralysis will not occur if sufficient antitoxin is injected to neutralize the toxemia.

In a severe case¹ (male, 8 years old), seen by me in the wards of the Willard Parker Hospital, the exudate completely covered the fauces. The tonsils, uvula, and pharynx were covered with one large mass of pseudo-membranes. The cervical glands were very much enlarged. The case looked decidedly septic. An injection of 5000 units of antitoxin was given on the first day, soon after admission to the hospital. A second injection of 5000 units was given on the second day. A third injection of 5000 units was given on the third day. A fourth injection of 5000 units was given on the fourth day, so that 20,000 units were administered during the first four days after admission to the hospital. The membrane exfoliated, the swelling of the glands disappeared, and one week after admission the throat was clear and the child was convalescent.²

Multiple neuritis is occasionally seen as a sequel to diphtheria. It is a form of paralysis involving groups of muscles, and the toxin usually selects the arms and legs.

In the Willard Parker Hospital, I have seen multiple neuritis involving the arms and legs. The symptoms are those of a pronounced paralysis affecting the muscles used in locomotion. As a rule multiple neuritis is seen in cases which were not recognized as diphtheria, and where an insufficient quantity of antitoxin was injected. Such insufficient dosage of antitoxin frequently results in paralysis.

The treatment consists in trying to overcome the toxemia by elimination through the skin, kidneys and bowels, and while many cases improve and do recover we occasionally see cases that remain paralyzed through life. It is advisable, therefore, to give a cautious opinion regarding the outcome of a case.

¹ The colored illustration plate XL, was drawn from this case at the bedside in the Willard Parker Hospital.

² This case was reported by me at a meeting of the New York State Medical Association.

Prognosis.—The outcome of a case of diphtheria depends on the severity of the infection and the complications if any. A child having rickets or scurvy in infancy is more liable to have organic complications such as cardiac or nephritic than one being in normal health. When diphtheria accompanies scarlet fever the prognosis is very grave. Likewise if diphtheria follows typhoid the prognosis should be guarded.

Diphtheria is more likely to attack children in crowded sections of the country such as the cities rather than rural districts where less habitation is found. Because of this factor many of these cases have less resistance and offer a poorer prognosis.

The temperature should never be a guide as to prognosis. Many cases of the septic type have a normal or a subnormal temperature and in these cases the prognosis is usually bad. In any case of diphtheria the prognosis depends on when treatment was first instituted. If antitoxin was injected on the first or second day of the disease then the outcome is more favorable than if the disease progressed four or five days without specific treatment.

Immunity.—The great advance made in testing children for their susceptibility to diphtheria by means of the Schick reaction will eventually eliminate all susceptibles. Until then it is safer to inject all children in institutions or schools exposed to a case of diphtheria with 1000 units of antitoxin. Immunity is usually conferred for a period of two or three weeks. If diphtheria still exists in the household three weeks after the immunizing injection a second immunizing dose should be given. For a child of one to five years 500 to 1000 units should be given, older children, 5 to 12 years, no less than 1000 antitoxin units. In a series of 6806 patients injected, 18 contracted diphtheria.

THE SCHICK REACTION.

Ever since Schick of Vienna found that immunity to diphtheria could be conveyed by the injection of toxin antitoxin the use of this method has been accepted as one of the most advanced steps in preventive medicine.

Equally important with conveying immunity is the intradermic test to ascertain the susceptibility of a child to diphtheria.

In New York City the Health Department has tested large groups of the public school children and it is hoped that in time all susceptibles can be immunized.

In a person susceptible to diphtheria, the blood does not contain antitoxin, and the toxin used for testing produces a reaction. This reaction is visible within twenty-four to thirty-six hours after such test is made. It remains three or four days, is of a pinkish or reddish color, and at the end of one week fades into a bronze color, which may remain visible two weeks or even longer.

It has been found that 85 per cent. of infants under six months of age are negative with this test. Between the second and fifth years, however, only 35 per cent. of children are immune, 65 per cent. being susceptible. The reason for this increase in susceptibility is that there is an inherited natural immunity conferred on the infant by the mother which lasts generally for about six months after birth, when it gradually decreases so that by the time the infant is 1 year old the inherited immunity has been greatly lessened and in only a small percentage of infants has there been a production of antitoxin on the part of the infant itself, called active natural immunity. In 65 per cent. of cases this active immunization does not take place and the infant is susceptible to diphtheria unless given an injection of toxin-antitoxin as later described.

Schick Technic.—The technic of the method is as follows: After an area of skin on the forearm has been cleansed with alcohol, the latter is encircled with the thumb and index finger, and the skin held tense between them.¹ The needle is dipped into the bottle of pure, undiluted diphtheria toxin and immediately inserted intradermally and not subcutaneously. The needle is an ordinary hypodermic bent at a distance of one-fourth inch from its point so as to make an angle of about 170 degrees. The angle aids in inserting the needle intradermally.

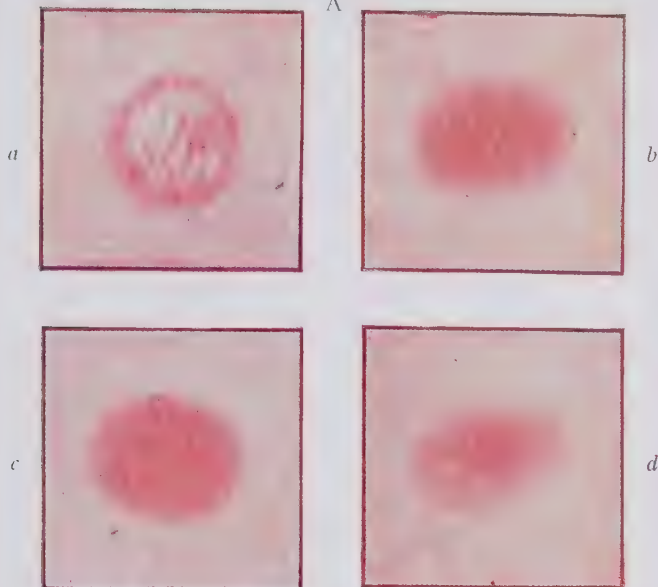
The toxin used by Schick and his associates² is a dilution of such strength that 0.1 cubic centimeter equals $\frac{1}{50}$ of the lethal dose for a 250-gram guinea-pig. The lethal dose of the toxin which Schick uses is 0.005, and hence he injects 0.1 cubic centimeter of a 1:1000 dilution. In those who react an area of reddening and infiltration develops within twenty-four hours, reaching its maximum in forty-eight hours, and which heals with scaling and a characteristic central pigmentation. Although the reaction is similar to the local tuberculin reaction, its interpretation is directly opposite. The

¹ KOPLIK and UNGER: Jour. Am. Med. Assn., April 15, 1916.

² VEEDER: Amer. Jour. of Dis. of Children, August, 1914.

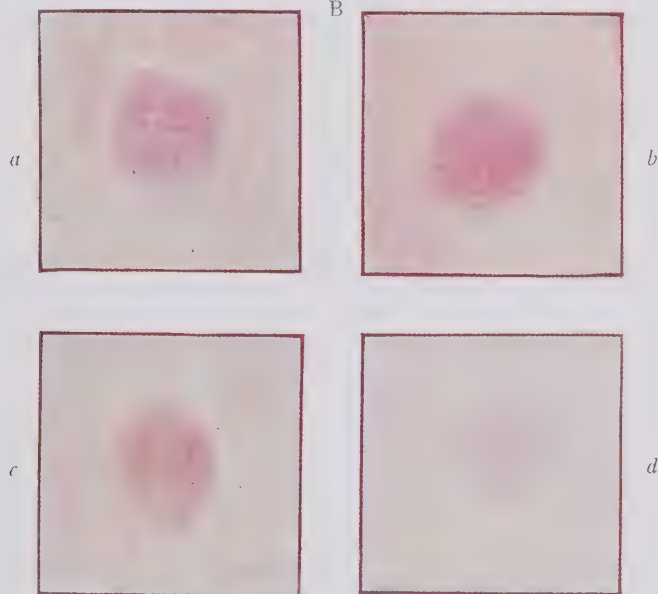
PLATE XLIV

A



A—Shows four typical positive Schick reactions of varying degrees of intensity forty-eight hours after test. *a* is a strongly positive reaction, with vesiculation of the surface layers of the epithelium, which is seen occasionally in individuals who have practically no antitoxin; *b* and *c* are positive reactions; *d*, a moderately positive reaction.

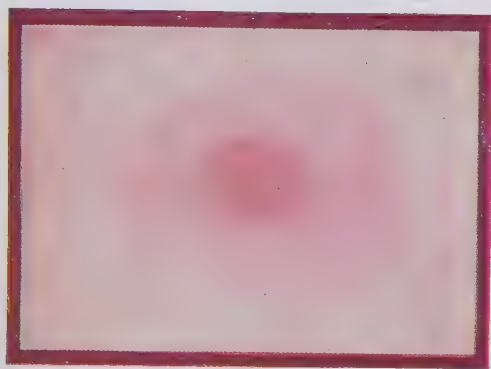
B



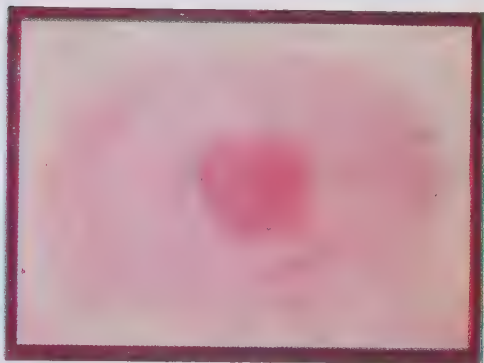
B—Shows a fading positive Schick reaction one to four weeks after test in various stages of scaling and pigmentation. *a* shows redness, scaling and beginning pigmentation after one week. *b* and *c*, pigmentation after two and three weeks; *d*, faint pigmentation after four weeks. (After Park and Zingher, Amer. Jour. Dis. Children, April, 1916.)

PLATE XLV

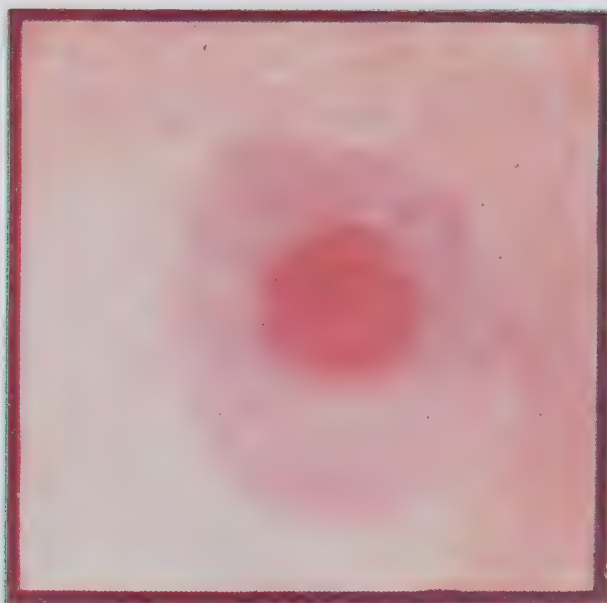
a



b



c



Shows two pseudoreactions forty-eight hours after test, and a combined reaction. *a*, mild; *b*, marked; *c*, a combined positive and pseudoreaction. (After *Park and Zingher*.)

diphtheria toxin is a direct toxic agent and by control tests of the blood serum it has been found that a *negative reaction is always associated with the presence of diphtheria antitoxin* in the blood of the person tested. While, as a rule, a positive skin* reaction is an indication of the absence of antibodies, some persons who possess a greater amount of antitoxin in the blood than 0.03 units per cubic centimeter, react positively for some unexplained reason.

It has been found that if a negative reaction follows the injection of a 0.1 cubic centimeter of a 1 to 1000 dilution of toxin, the individual has at least 0.031 units of antitoxin per cubic centimeter in his blood when tested by Romer's method. A person with a higher concentration of antitoxin will react negatively to a smaller dilution of antitoxin and *vice versa*. Thus the outcome and the degree of reaction are dependent on two factors—the strength of the toxin used and the presence of antitoxin in the blood.

As there is no antitoxin present in the blood in acute diphtheria, the use of the reaction for diagnostic purposes has been suggested. Thus, in a suspected case or questionable diagnosis a negative reaction—indicating the presence of antitoxin—would speak against the diagnosis of diphtheria.

If there is a positive Schick reaction then it is necessary to confer immunity by injecting $\frac{1}{2}$ to 1 c.c. of toxin-antitoxin. The injection should be repeated once a week until 3 injections have been given. A slight reaction frequently follows. The reaction consists of fever and local redness or swelling at the site of the injection.

Antitoxin given intramuscularly before or simultaneously with the toxin usually completely inhibits the Schick reaction.

Treatment.—When the diagnosis of diphtheria is positive the age or the weight of the child should be considered and a proper dose of antitoxin administered.

The following factors must be remembered in order to have a successful result in diphtheria: Give antitoxin early. Give sufficient antitoxin. Do not rely wholly on antitoxin. Keep the bowels open. Relieve constipation with a saline. Stimulate the kidneys. Bathe the body daily thus aiding elimination by keeping the pores open. Study the pulse and stimulate early in the disease. Remember that food and fresh air are the most important factors, next to antitoxin.

The following table gives the dosage of what has been a successful method of treating the disease at the Willard Parker and Riverside Hospitals of New York City.

TABLE NO. 44.—DOSAGE OF ANTITOXIN.

| | Mild Cases. | Moderate. | Severe Including Laryngeal. | Malignant. |
|--|--------------------|----------------------|-----------------------------------|------------------------|
| Infants—10 to 30 pounds in weight (under 2 years of age) | 2000 to 3000 | 3000 to 5000 | 5000 to 10,000 | 10,000 |
| Children—30 to 90 pounds in weight (under 15 years of age). | 3000 to 4000 | 4000 to 10,000 | 10,000 to 15,000 | 15,000 to 20,000 |
| Adults—90 pounds and over in weight | 3000 to 5000 | 5000 to 10,000 | 10,000 to 20,000 | 20,000 to 40,000 |

Moderate cases of laryngeal diphtheria, seen late at the time of the first injection, and cases of diphtheria occurring as a complication of the exanthemata should be classified and treated as severe.

Effect of Antitoxin on the Blood.—Park studied the effect of antitoxin and he believes that if an injection of 10,000 units was given to children a second injection rarely was necessary. The antitoxin was found to reach the blood-stream slowly, increasing up to the third, fourth, or fifth day, and then slowly decreasing. That if the second dose were given twelve hours after the first the beneficial effects which might be attributed to it were really due to the continued absorption of the first dose, the second only contributing its share. When antitoxin is given intravenously it enters the blood-stream immediately; therefore, this means should be used in desperate cases.

Intravenous Injections.—The most rapid method of bringing the antitoxin into direct contact with the toxin is by intravenous injection. The dose injected should be at least 10,000 to 20,000 units. The site of the injection preferred is the median basilic vein at the bend of the elbow. In very young infants the jugular vein is more preferable. With a supporting pillow at the nape of the neck the jugular vein stands out prominently and the technic of the injection is simplified. In many instances it will be necessary to expose the vein in order to successfully inject

the antitoxin. If we are careful to exclude all air while injecting the antitoxin, no untoward symptoms will follow. If the site of the median basilic vein is chosen, compression above the bend of the elbow will make the vein stand out prominently. Sterilize the surface, and inject several drops of novocaine. Make a small incision across the course of the vein.

The arm is corded above the elbow, so as to cause the vein to become distended and prominent. The vein is then transfixed with a straight surgical needle. The cord may then be loosened and the needle of the syringe inserted into the vein at right angles to and beneath the surgical needle, which is raised by a

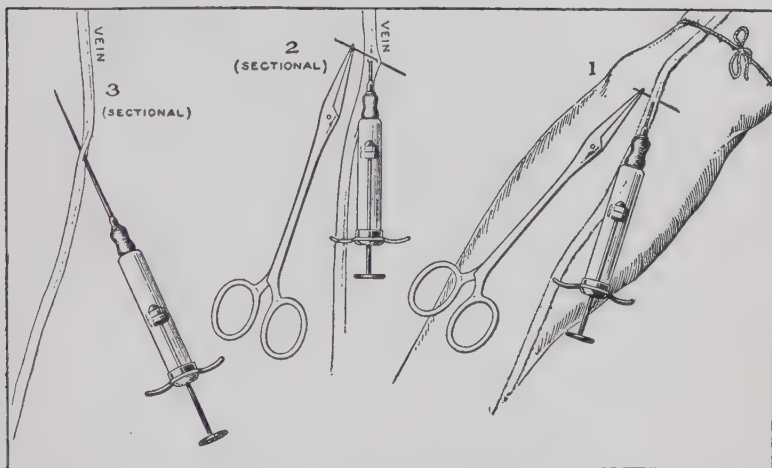


Fig. 157.—No. 1 shows the method of transfixing and raising the vein with a sewing-needle and holding it in the elevated position by means of a hemostat. The syringe needle is shown inserted into the vein beneath the transfixing needle. No. 2 shows more in detail the method of fixation and the insertion of the needle. No. 3 shows what frequently happens in attempting to insert the needle of the syringe without first fixing the vein. (After *Watson*.)

hemostatic forceps. Fig. 157 illustrates the advantages of this method.

If this should be necessary a more practical method in an infant is to inject the antitoxin through the longitudinal sinus. This technic has been described in the chapter on blood transfusion and is also illustrated. Carefully done there is no danger. The antitoxin enters the blood stream at once and exerts its specific action more rapidly.

Elimination of Toxins.—The usual effect of diphtheria toxin is to inhibit the action of the kidneys and bowels. We must therefore stimulate their action by giving drugs which will act on both. If the child has had fever, the febrile process dehydrates the system and there is an indication for liquids. A simple laxative with diuretic qualities, such as citrate of magnesia given in small doses is pleasant and will cleanse the gastrointestinal tract in addition to stimulating the kidneys; it also supplies water so necessary in febrile diseases. Calomel and other hydragogue cathartics while they cleanse the intestinal tract should be avoided as they dehydrate the system.

Mamie B., 2 years old, was seen by me through the courtesy of the attending physician, on the second day of her illness. There were patches of diphtheria visible on the pharynx and tonsils. The temperature was 101½° F., pulse 140. There was also laryngeal involvement noticeable by the croupy cough. An injection of 2000 units of antitoxin was first given. The colon was flushed and the bowels thoroughly emptied. A dose of calomel was given and milk and albumin water ordered for the diet.

Nasal irrigations of saline solution were ordered every two hours. An ice-bag was applied to the neck. On the third day the temperature rose to 102° F., pulse 130, respiration 36. Breathing labored—considerable retraction of the chest—cough very croupy. Large quantities of mucus were expectorated. The pulse was 146, respiration 40. Stimulation was demanded and 1 dram of whisky was given every hour. Laryngeal stenosis was so severe that a hurry call was sent to me to intubate. The child was quickly intubated. A No. 3 rubber tube having a coating of gelatine and alum was inserted. The stenosis was immediately relieved.

The child appeared comfortable and fell asleep. Six hours after the intubation the temperature was 103° F., pulse 140, respiration 40. Cold sponging was ordered and, owing to severe coughing when liquids were given, semi-solids were ordered while the intubation tube was *in situ*. On the following day the temperature dropped to 101.6° F., and on the third day after intubation the child was practically normal. The tube was left in the larynx five days, and as soon as the temperature dropped to 99° F. the child was extubated. The patient made an uneventful recovery. No complications followed. I might add that the usual rule of administering 15 grains of bromide of sodium or ¼₁₂ grain of sulphate of morphine, as an antispasmodic, one hour before extubation was not given in this case.

Medicinal Treatment.—Locally a spray or gargle of warm saline solution will cleanse the throat and remove particles of membrane. Dobell's solution may be dropped into the nostril every two hours. To relieve the odor of the putrid membranes use

one-half per cent. solution of permanganate of potash as a spray or gargle in the throat. If this solution is dropped into the nostrils there is no danger of infecting the Eustachian tubes. Un-

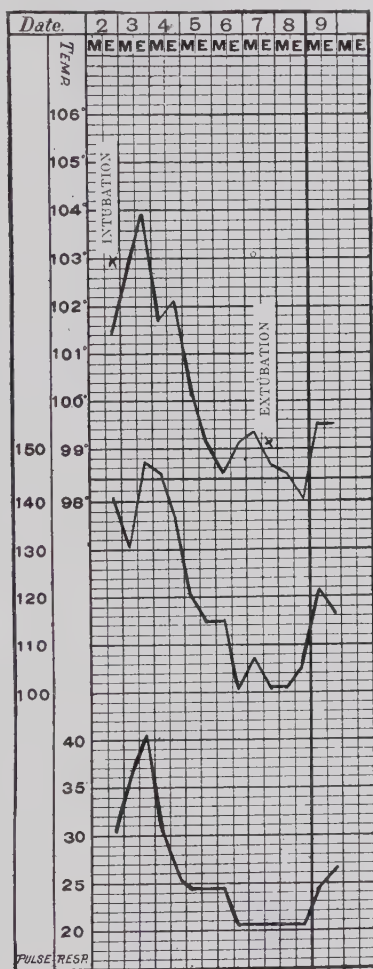


Fig. 158.—Note rise in temperature after injection of antitoxin. Note its specific effect, within three days, on temperature, pulse and respiration.

less one is expert in syringing a nose and avoiding the Eustachian tube, syringing should be avoided.

The solvent effect of local remedies on pseudomembranes I have never verified.

When diphtheritic exudate has been forcibly removed by local cauterization or with forceps a more extensive membrane will reappear.

The Lymph Glands.—The local treatment by rubbing with salves or applying iodine externally has no value, nor has an ice-bag although it is frequently advised. The reason for the swollen lymph glands is found in the nares and throat and this is where treatment should be carried out.

When children complain of severe pain then a local application of a warm poultice of flaxseed meal or a hot water-bag will relieve.

Fever Treatment.—Antipyretic drugs owing to their cardiac depression should never be ordered in diphtheria. To conserve the strength of the child we must guard the heart as much as possible.

Tub baths (read article on Hydrotherapy) are excellent for reducing fever and will soothe the child, promoting sleep—the latter a very important factor.

Stimulation.—Many clinicians believe in leaving a child alone—in leaving nature take its course, and trusting to antitoxin, food, rest and fresh air. While this is good in very many cases a large number will be found wherein previous diseases or systemic defects such as rickets, scurvy, or chronic catarrhal conditions have so undermined the system that the heart action is feeble. In such cases we must stimulate.

To support the heart, hypodermic injections of 5 to 20 drops of adrenaline chloride 1:1000 may be repeated every half hour until the heart is stronger.

Strychnine $\frac{1}{100}$ grain gradually increased to $\frac{1}{50}$ grain may be given every two hours, with or without whiskey until the pulse improves. Caffein sodium benzoate in $\frac{1}{4}$ grain doses is a diffusible heart stimulant and aids diuresis. An infusion of 4 ounces of warm saline solution given in the loose cellular tissue of the abdomen (hypodermoclysis) at a temperature of 105° F is indicated in an atrophic child or a case of marasmus.

Paralysis.—Deep intramuscular injections of strychnine sulphate $\frac{1}{100}$ grain, may be given twice a day, and increased daily to the point of tolerance, in some children as high as $\frac{1}{20}$ grain per dose can be given.

The use of electricity such as galvanic and faradic should not be advised in the early stages of the paralysis. Rest and

gentle passive motion and a supporting diet is all that is required in the first two weeks following a paralysis.

Desquamation.—A very fine, mealy desquamation follows the antitoxin rash. It is similar to the measles desquamation. A rash resembling measles never has the catarrhal symptoms which we always note in genuine measles. If, however, we are in doubt regarding the true nature of the rash, it is well to isolate and await results rather than to expose children to the risk of infection.

Experience has taught us that food is the most important element of treatment. Too much reliance must not be placed on antitoxin. Unless we support the tissues with sufficient nutrition the patient will die. Liquid food such as oatmeal gruel, farina and milk or barley and milk should be ordered. Carbohydrate feeding should be combined because of the tendency to acidosis in all acute infectious diseases.

Vegetable broths such as peas, cream of spinach, lamb or chicken broth will aid nutrition. The yolk of egg added to milk should be given at least once a day. When children refuse food then ice cream should be tried; it is cooling, nutritious and well liked. Fruit jelly such as jell-o and cold chicken jelly may be given. Buttermilk or any Bulgarian milk is cooling and has a laxative tendency. Water, lemonade, orangeade, and pineapple juice may be given for thirst.

When children refuse food especially while an intubation tube is in the larynx, then nasal gavage or the Castleberry method of feeding is advised. Semi-solid food such as rice pudding, tapioca pudding, junket and custard will aid nutrition.

In infantile pneumonia and diphtheria with laryngeal stenosis gavage may be necessary. In such cases the breast pump should be utilized to draw off sufficient milk for each feeding. The receptacle or cup into which the milk is pumped must be scalded with boiling water before using to insure sterility.

In some cases stimulation may be called for and it may be necessary to add 20 to 30 drops of whiskey to each nutrient enema.

Rectal feeding with peptonized yolk of egg or peptonized milk should be remembered if vomiting is present or when it is impossible to feed by mouth. In septic cases with marked exhaustion from prolonged fever and where emaciation exists,

transfusion* is indicated. The latter therapeutic agent should be tried if dehydration is noted.

Rectal Feeding.—No more than 2 ounces should be injected at one time.

Milk, predigested 2 ounces.
Starch water or gum arabic water 1½ ounces.

To be injected slowly through the colon tube after both colon and rectum have been cleansed by a soap-suds enema.

* Read article on Transfusion.

III.

PSEUDO OR FALSE DIPHTHERIA.

UNDER this general title are included all cases of pseudo-membranous or exudative inflammation of the mucous membranes in which the diphtheria bacilli are absent.

Since Löffler, in 1889, first described a class of pseudo-membranous inflammation of the throat in which the diphtheria bacilli were absent and cocci present, it has been established that a certain portion of the inflammations of the respiratory mucous membranes, which closely resemble the less characteristic cases of diphtheria, are not due to the diphtheria bacilli, but to cocci, especially to streptococci.

It has been found that streptococci are commonly present in the throats of healthy persons, or at least in the throats of persons living in large cities, and that other forms of cocci, especially the pneumococci and staphylococci, are apt to be associated with them.

These germs seem to live in the throat without creating any disturbance there, so long as the mucous membranes are healthy; but under certain conditions, as when the mucous membrane has been made vulnerable by exposure to cold or other deleterious influences, or by the poison of scarlet fever, measles, or some other disease, the streptococci, alone, or associated with other cocci, are able to attack the mucous membrane and to cause an inflammation. This may be of any degree of intensity from a simple inflammatory hyperemia to an inflammation with an extensive production of pseudo-membrane or with ulceration. Such inflammations when associated with the formation of pseudo-membrane are known as pseudo-diphtheria. The exudate or pseudo-membrane in pseudo-diphtheria is usually confined to the tonsils, but other parts, such as the larynx, pharynx, and nostrils, may be invaded.

It has been found that the percentage of mortality in these cases is *far less* than in diphtheria, and that the disease is seldom if ever, communicated to others.

Proportion of Cases of Suspected Diphtheria which upon Examination Prove to be True Diphtheria.—As soon as careful in-

vestigation had demonstrated it was possible, with proper precautions, to separate by bacteriological examination the cases of the true from those of the false diphtheria, large numbers of cases suspected to be diphtheria were examined bacteriologically. The reports from hospitals in which all cases of suspected diphtheria were examined, are of special interest as showing the proportion of cases of true to false diphtheria. The results from these hospitals are all the more valuable because they come from all parts of the various cities in which the respective hospitals were located, and hence special local conditions were not likely to greatly influence the result obtained. Thus, Baginsky, in Berlin, found the diphtheria bacilli in 120 out of 244 suspected cases; Martin, in Paris, 126 out of 200; Park, in New York, 127 out of 244; Janson, in Switzerland, in 63 out of 100, and Morse, in Boston, in 239 out of 400. Thus, from 20 to 50 per cent. of the cases sent to diphtheria hospitals did not have diphtheria.

If we examine the reports of examinations made under some special conditions, as during an outbreak of some contagious disease in a hospital for children, we find the results may differ in a striking manner.

Prudden made bacteriological examinations of 24 fatal cases of pseudo-membranous inflammation of the tonsils, pharynx, and larynx. In none of these were the Löffler bacilli found to be present. These cases occurred in two hospitals for children in New York in which both scarlet fever and measles were at the time prevalent. During the past year we have examined the exudate from 46 fatal cases of suspected diphtheria occurring in these same institutions, and found the bacilli present in 44 of them.

If scarlet fever and measles (but not true diphtheria) were prevailing in an institution, it is evident the bacilli would be absent from the pseudo-membranes occurring in the throat as a complication of these diseases. All observers have found the mortality far higher in those cases in which the diphtheria bacilli were present than in those in which they were absent. In true diphtheria the mortality has been found to vary from 25 to 70 per cent., while in pseudo-diphtheria it varies from 0 per cent. to 20 per cent.

IV.

DIPHTHEROID.

THIS is a disease in which there is a slight rise in temperature and a pseudo-membrane covering the tonsils and pharynx. The systemic evidences of depression, toxemia, and the swelling of the cervical glands are never present. The characteristic fetid odor of diphtheria is wanting. Children so affected complain of sore throat, pain on swallowing, and at times muscular pains resembling rheumatism.

A culture taken shows the absence of the Klebs Löffler bacillus. A staphylococcus or chain of streptococci and the streptococcus mucosus and the micrococcus catarrhalis are among the pathogenic bacteria most usually found.

All cases of this kind are contagious and can be transmitted from child to child, therefore strict isolation is necessary.

Course and Complications.—This condition usually lasts from three to seven days. If properly treated, with good hygiene and restorative diet, no complication follows. An extension of this infection through the Eustachian tubes may give rise to otitis. The emunctories, chiefly the bowels, must be kept open otherwise fever will result. This is especially true if a liberal diet is given while the child is in bed.

Treatment.—A spray of Dobell's solution and water equal parts should be used, or a gargle, if the child is old enough to wash the throat clean before feeding. The local application of tincture of iodine, once only, is valuable. Tincture of chloride of iron in ten drop doses added to one or two teaspoonfuls of water can be given every two hours for its local and systemic effect.

Food.—Cereals, milk, eggs, custard, and ice cream can be given to an older child. Children under one year should have milk every three hours, and if fever is present, milk diluted with equal parts of water.

V.

CHRONIC DIPHTHERIA.

THERE are two varieties which characterize this condition:—

The first form is simply the continuation of an acute attack of diphtheria running a prolonged course. Second, a chronic form in which symptoms of pseudo-membranous rhinitis exist and which may be present months or years.

In the prolonged type previously mentioned, fever, glandular swelling and general systemic disturbances mark the beginning of the attack. In the latter type the febrile manifestations and general constitutional disturbances are totally absent.

Diagnosis.—When membranes persist for weeks and if fever is absent we should examine carefully for enlarged glands. The similarity of mucous patches in syphilis should always be remembered. The blood should be examined for a Wassermann reaction. At the Willard Parker Hospital I have frequently found cases admitted as probable diphtheria, which proved later on, to be cases of syphilis. One should be careful, therefore, not to call a case chronic diphtheria, until a negative Wassermann is found.

Not all cases show the Klebs-Löffler bacillus. But if the Klebs-Löffler bacillus was present early in the disease, and the membrane persists then the diagnosis of chronic diphtheria is justifiable. All cases should be isolated; those having enlarged tonsils and adenoids to be quarantined at least until all membranes have disappeared.

Prognosis and Course.—Such cases require very careful observation, and a very guarded opinion should be expressed as to the length of time that the condition will last. Not infrequently tuberculosis or some form of chronic bronchopneumonia may follow with fatal result. In a case of chronic diphtheria extending over seven months which was complicated by enterocolitis during midsummer, the result was fatal.

Isolation.—The presence of the Klebs-Löffler bacillus demands the strictest isolation from all healthy persons. The virulent nature of the Löffler bacillus should be remembered. All children suffering with enlarged tonsils or those having adenoid vegeta-

tions should be carefully guarded against exposure to a case of this kind, as they are more prone to infection than those having healthy throats.

Treatment.—Chronic diphtheria usually attacks children with subnormal vitality, hence restoratives such as arsenic and iron should be given. The most valuable drug undoubtedly is iron. The tincture of the chloride of iron, 10 to 30 drops, three times a day or oftener, is very useful for its local as well as its systemic effect. It may be prescribed, despite its constipating tendency, for many weeks.

Codliver oil, butter and olive oil should be ordered liberally, also buttermilk, eggs, cereals and broths. When children have low vitality, cold extremities, thready pulse, and poor appetite then an infusion of four ounces of warm saline solution should be given daily.

When membranes persist for many months the injection of neo-salvarsan is indicated. In a series of cases of noma which were injected with neo-salvarsan at the Willard Parker Hospital specific results were noted in three out of six cases otherwise considered fatal.

INTUBATION.

When laryngeal stenosis occurs during a case of diphtheria, then we must prepare for intubation.

The following symptoms demand immediate intubation:—

Labored breathing.

A gradual and progressive dyspnea.

A failing or intermittent pulse.

Cyanosis showing defective oxygenation.

Retraction of chest wall most marked at epigastrium or at the clavicles.

When the accessory muscles of respiration are brought into play.

When the child is compelled to sit upright in order to breathe and pulls at its neck and throws itself from side to side, gasping for breath.

The management of a case of intubation in private practice should be carefully considered. No child should be permitted to wear a tube in the larynx without the constant supervision of a trained nurse. In the Willard Parker Hospital we have competent trained nurses both night and day, and a physician is al-

At James L. Taylor

ways ready to respond in case of emergency. I have frequently intubated in private practice and always give the following orders to the trained nurse:—

First.—If the breathing becomes labored or if the child has a sudden increase in the number of respirations, notify the physician at once.

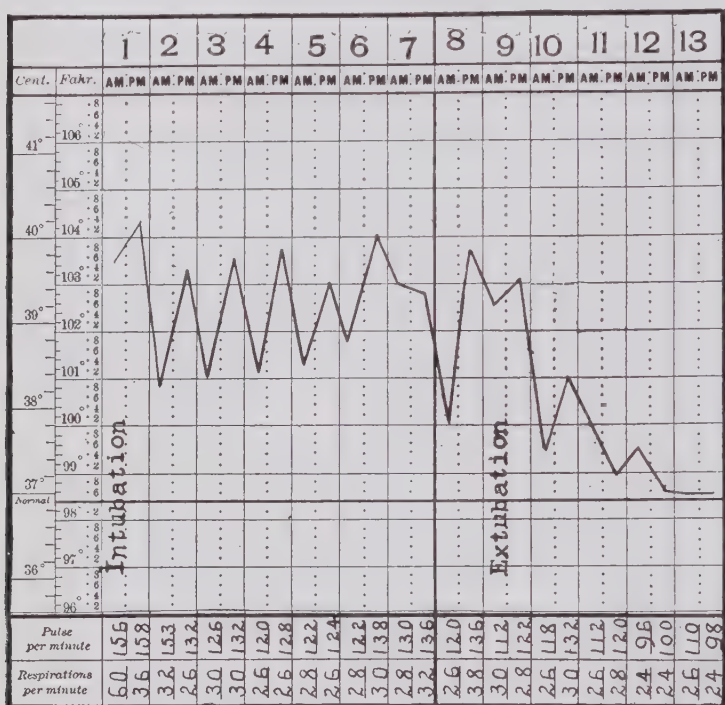


Fig. 159.—Baby K, nursing infant, 11 months old, suffered with laryngeal diphtheria complicated by bronchopneumonia. Stenosis requiring intubation. Tube remained in larynx nine days. Child recovered.

Second.—Watch the pulse; a sudden increase in the pulse-rate or a sudden, intermittent pulse means danger.

Third.—If cyanosis or sudden apnea occurs, possibly caused by a plugging of the lower portion of the tube with membrane, notify the physician so that the tube can be extubated and a tube of larger caliber inserted.

Fourth.—If the tube is suddenly expelled during a paroxysm of coughing (auto-extubation), a hurry call should be sent to the physician.

Emergency Orders.—*First.*—Give a mustard foot-bath or apply a mustard plaster over the heart to stimulate the circulation.

Second.—Camphor 10 grains dissolved in 1 ounce of ether. Use 10 drops hypodermically. Repeat every fifteen minutes until the circulation is restored, or give 5 to 10 drops of aromatic spirits of ammonia with an equal quantity of whisky. Nitroglycerine can be given in $\frac{1}{100}$ -grain doses every hour, hypodermically if necessary.

Third.—Relieve the stenosis, if it exists, by careful intubation.

Fourth.—If an expert intubator is not at hand, or if intubation pushes the membrane downward so that the stenosis persists, resort to tracheotomy.

Regarding extubation, my rule in private practice is to extubate on the fifth day, or on the morning of the sixth day, provided the temperature is normal and no complication exists. *It is safer to leave a tube in the larynx one day longer than risk the necessity of reintubation.*

My two principal rules in intubation and extubation are: *First*, avoid force, thereby avoiding injury. This rule has been my greatest aid in preventing retained tubes. *Second*, do not hurry. While in a severe laryngeal stenosis a certain amount of haste is necessary in selecting the proper-sized tube and making preparations, when it comes to the introduction of the tube, the inflammatory process and subnormal condition must be remembered; hence, it is better to proceed slowly.

Occasionally a momentary spasm retards the immediate entry of the tube into the larynx, in which case, rather than use force, it is best to wait a second or two for this to relax, when the tube will fall into place. The introducer should be held lightly between the thumb and finger, and not grasped firmly in the hand. The introducer should be kept exactly in the middle line; otherwise the obturator will pinch in the caliber of the tube and drag the latter with it as it is withdrawn. It often happens that the child manages by one effort to slip down in the nurse's lap while the grasp that the assistant exerts tilts the head back, and the tube may impinge on the posterior wall of the larynx. The lines and angles must be maintained to insure quick intubation. The lack of observance and carelessness in these points explain many failures of inexperienced operators. *If the tube is not properly placed at the first attempt, it is better to begin all over,*

making repeated short attempts, *if necessary, rather than a single prolonged one.*

TABLE NO. 45.—INTUBATION CASES WILLARD PARKER HOSPITAL.

| Year. | Admitted. | Discharged. | Died. | Mortality Including 48-Hour Cases. |
|-------|-----------|-------------|-------|------------------------------------|
| 1915 | 145 | 100 | 45 | 58% Recoveries. |
| 1916 | 158 | 105 | 53 | |
| 1917 | 167 | 107 | 60 | |
| 1918 | 218 | 113 | 105 | |
| 1919 | 273 | 140 | 133 | |
| 1920 | 243 | 130 | 113 | |

Pneumonia Complications.

1919 Percentage.

3.5

1920 Percentage.

5.9



Fig. 160.—Introducer with tube attached.

*Indications for Intubation.*¹—The indications for intubation are marked by a more or less sinking in of the yielding portions of the chest, lower ribs and sternum, episternal notch, and supra-clavicular regions with inspiration. It means simply that air can not gain entrance to the lungs in sufficient quantity to fill the partial vacuum created by the expansion of the chest, and the wall recedes under the weight of the atmosphere. It is very marked in very young or rachitic children owing to the greater elasticity of the ribs. But it should be remembered that this condition is not peculiar to stenosis of the larynx and trachea, as it is produced to a lesser degree by obstruction in any part of the respiratory tract that interferes with the free inflation of the lungs. It is found in capillary bronchitis, extensive deposits of pseudo-membrane in the bronchi, atelectasis, and to some extent

¹ From O'Dwyer's treatise on "Intubation" in his book, "Diphtheria and Croup."

even in bronchopneumonia. Recessions at the root of the neck are more significant than those below, as the violent contractions of the diaphragm aid in drawing in the free border of the ribs and sternum.

When recessions are marked there is little or no respiratory

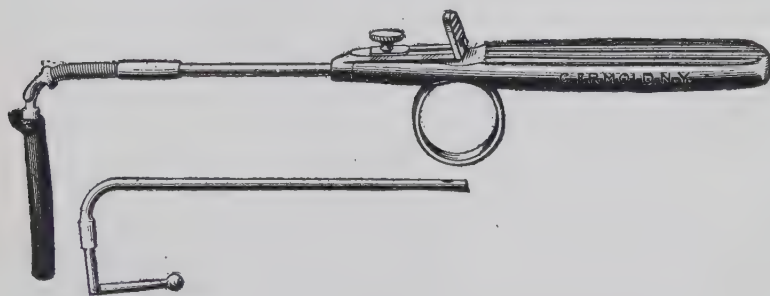


Fig. 161.—Introducer with tube and detached obturator.

murmur over the posterior portion of the chest, but this symptom is not always available owing to the laryngeal stridor.

The downward movement of the larynx with inspiration is pathogenic of serious obstruction in this organ, and is also the result of atmospheric pressure, the air being prevented from en-



Fig. 162.—Introducer holding foreign-body tube.

tering with sufficient rapidity to fill the partial vacuum below. It is readily detected in adults, but not so in children, owing to the deeper situation of the larynx in the latter.

This symptom is not present in stenosis of the trachea, owing to the great elasticity of this tube, which permits of considerable motion on itself without displacing the larynx.

The temporary cyanosis which comes and goes with the paroxysmal dyspnea of the second stage of croup is of no particular

significance. *Children seldom remain long in one position when suffering severely from want of breath, and continued restlessness, if consciousness be unimpaired, is therefore an important indication that it is time to afford relief.*

As far as the necessity for intubation is concerned, it matters little as to the real nature of the obstruction, provided it be in the larynx and not a foreign body. It may be croup, simple laryngitis, edema of the glottis, paralysis, spasm, or even a neoplasm. In the latter it will tide over the immediate danger of asphyxia, and leave more breathing room to facilitate the radical operation.

Dorsal Method of Intubation.—This method is the most convenient, as it does away with the necessity of several assistants.



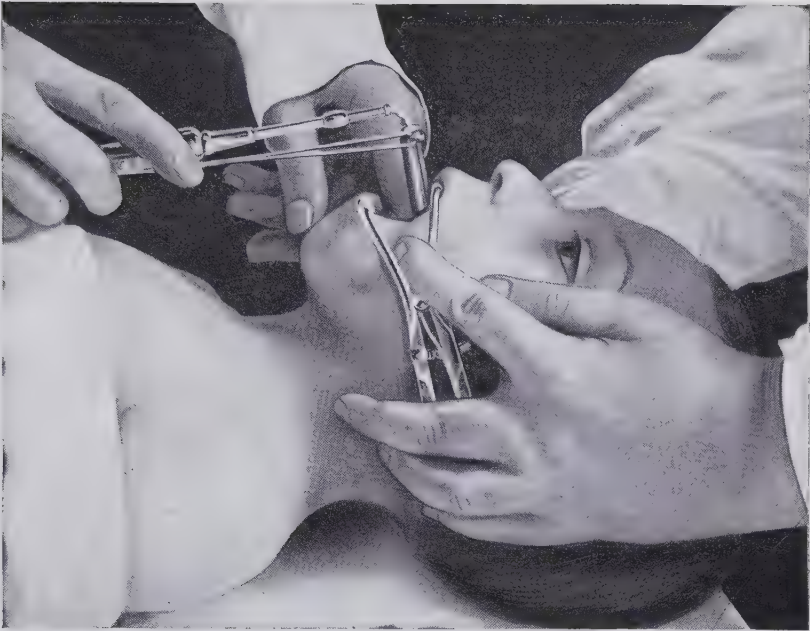
Fig. 163.—The mummy bandage, showing child in proper position for the dorsal method of intubation. All instruments required are carefully arranged.

I have frequently intubated in the dorsal position without any assistant. This method appeals to me as very valuable in emergencies, especially so when a physician is called out of town and where no trained assistant is available. The method of introducing the tube is the same as that described as the O'Dwyer method. The dorsal method is the one now used at the Willard Parker Hospital.¹

The gag should be inserted into the left side of the mouth, and slowly opened. The trained nurse steadies the child's head and holds the gag in place. With the child flat on its back, the hands firmly held by a blanket encircling the body, the physician stands on the right side of the child and introduces the index finger of his left hand in the median line until the epiglottis is

¹ The set of photographs illustrating intubation, extubation, and gavage were taken in the wards of the Willard Parker Hospital.

PLATE XLVI



Intubation. First step. Index finger raising the tip of the epiglottis.
The tube guided along the finger.



Intubation. The tube passing the epiglottis. Entering the larynx.

felt. The epiglottis should be raised and fixed. The tube should then be guided with the right hand of the operator, along the left index finger, and inserted into the *cul-de-sac* of the larynx.

It would be profitable to read O'Dwyer's description of the method of intubation which is appended here. In the days of O'Dwyer the child was put in the upright or sitting position

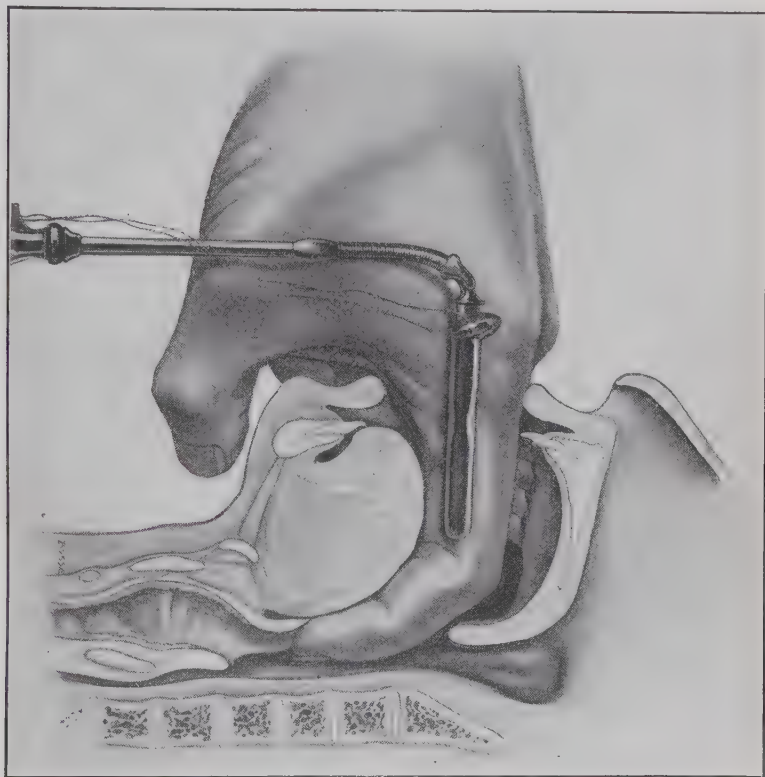


Fig. 164.—Intubation. Left index finger raising the epiglottis. The introducer with tube attached is glided along the finger.

for intubation. The only difference being that O'Dwyer recommends the sitting position, whereas I advocate the dorsal position.

O'Dwyer's Method.—The nurse or person who holds the child should be seated on a solid chair with a low back, and the patient placed on the lap with head resting on left shoulder of nurse in order to leave the gag free. The hands can either be held or, still better,

secured by the sides, by a towel or sheet passed around the body and left in that position until the tube is inserted and the string removed. Fastening the hands in front of the chest or thick garments in the same location renders it more difficult to depress the handle of the introducer sufficiently to carry the tube over the dorsum of the tongue.

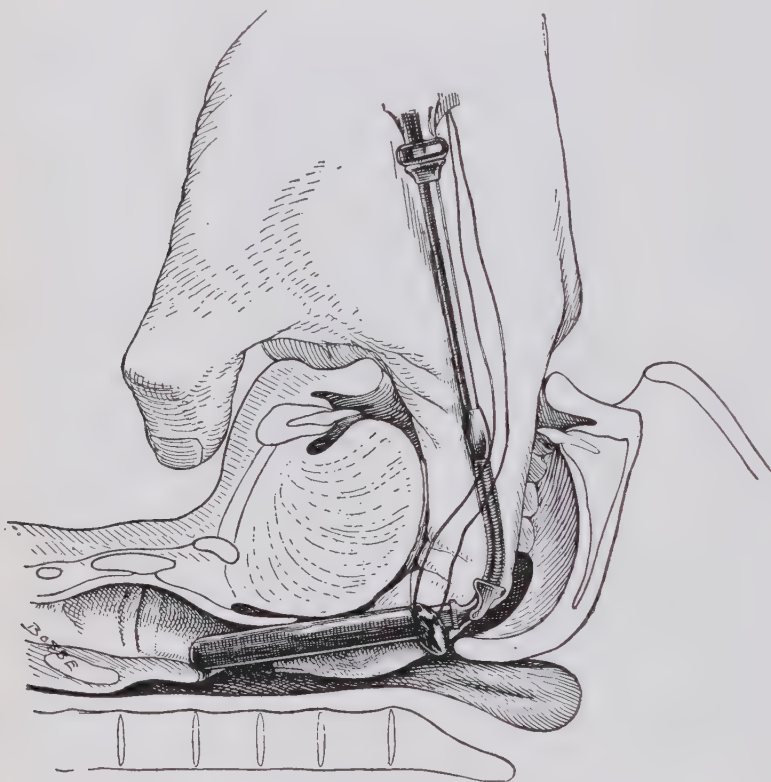


Fig. 165.—The tube, passing the epiglottis, entering the larynx.

The gag is then inserted well back behind or between the teeth in the left angle of the mouth and opened widely, care being taken not to do it too suddenly or to use too much force. In children who have not at least one bicuspid on the left side, the gag should not be used, as it slips forward on the gums, and, besides being in the way, is liable to injure the incisor teeth. There is little difficulty in these cases in keeping the mouth sufficiently open with the finger, if carried far enough to the patient's right

to be out of range of the front teeth. Allowing the child to compress the finger between the gums for a few seconds until the jaws relax, before carrying it into the fauces, avoids the necessity for using force.

An assistant stands behind the patient and holds the head firmly by placing one hand on either side, and at the same time slightly elevates the chin. The operator stands in front of the patient, holding the introducer lightly between the thumb and fingers of the right hand, the thumb resting on the upper surface of the handle, just behind the knob that serves to detach the tube, and the index finger in front of the trigger support underneath. Held in this manner it is impossible to use force enough to make a false passage, while if firmly grasped in the hand the beginner may, unconsciously, exert sufficient force to lacerate the tissues.

The index finger of the left hand is carried well down in the pharynx or beginning of the esophagus and then brought forward in the median line, raising and fixing the epiglottis, while the tube is guided along beside it into the larynx. If any difficulty is experienced in locating the epiglottis, it is better to search for the cavity of the larynx, a *cul-de-sac* into which the tip of the finger readily enters, and which cannot be mistaken for anything else. Once in this cavity, the epiglottis must be in front of the finger and the latter is then raised and pressed toward the patient's right to leave room for the tube to pass beside it. The distal extremity of the tube should be kept in contact with the finger, and even directing it a little obliquely toward the right side of the larynx if necessary to get inside the left aryepiglottic fold, especially in very young children. The handle of the introducer is held close to the patient's chest in the beginning of the operation, and rapidly raised as soon as the end of the tube has passed behind the epiglottis; otherwise it will slip over the larynx into the esophagus.

Some operators hold the introducing instrument in the horizontal position until the tube is well back in the fauces, and then swing it around to the middle line and complete the operation in the usual manner. The beginner is liable to forget the latter movement, which is the only objection to this plan.

As soon as the cannula is inserted the introducer with obturator attached is withdrawn by pressing forward the button on the upper surface of the handle with the thumb, while counter-pres-

sure is made with the index finger on the trigger beneath. In removing the obturator—the joint in the shank of which is intended to facilitate this part of the operation—the movements required for insertion are reversed. To prevent the tube from being also withdrawn, the finger must be kept in contact with its shoulder either on the side or postèriorly.

The tube should be carried well down in the larynx before detaching it; otherwise the lower aperture will be left open and liable to strip off pseudo-membrane as it is subsequently pushed home with the finger.

The gag is removed as soon as the tube is in place, but the string is allowed to remain in place long enough to be certain that the stenosis is relieved and that no loose membrane exists in the lower portion of the trachea. In some cases the presence of the thread is desirable because it excites more coughing, which is necessary to expel accumulated secretions and to inflate any collapse of the lungs that may have taken place. In removing the string the finger must be reinserted to hold the tube down, but the gag is rarely necessary, as children old enough to understand readily open the mouth for this purpose.

The characteristic tubal cough due to a rush of air through the tube when in the larynx, if once heard, will always be remembered. Usually the presence of the tube excites a paroxysm of coughing and large quantities of mucus and membrane will frequently be expelled. The effect most noticeable is the immediate relief of the laryngeal stenosis. It is wise to wait five or ten minutes before withdrawing the silk thread that has been placed in the tube. After cutting the thread the finger should again be placed over the head of the tube, and the tube firmly pressed down while the string is withdrawn.

Accidents During Intubation.—Repeated attempts to introduce a tube in an exhausted child will produce apnea and result fatally.

Ten seconds is the longest time that should be occupied in each attempt, if the child is suffering from urgent dyspnea at the time. A child cannot breathe while the finger is in the throat. Repeated attempts will so exhaust the vitality of a child that this must be reckoned with.

The expert seldom requires more than five seconds to complete the operation, except in difficult cases, such as a very small mouth and throat, marked increase in the size of the tonsils,

especially if chronic; extreme tumefaction of the epiglottis and aryepiglottic folds, which changes or obliterates the usual landmarks, and the struggles and resistance sometimes offered by older children when intractable. In the latter, although I have never had to resort to it, the *administration of an anesthetic would be less injurious* than the exhaustion and cyanosis induced by a prolonged struggle without it.

If the tube has once passed on the outside of the larynx, and this is recognized before it is detached from the obturator, it is

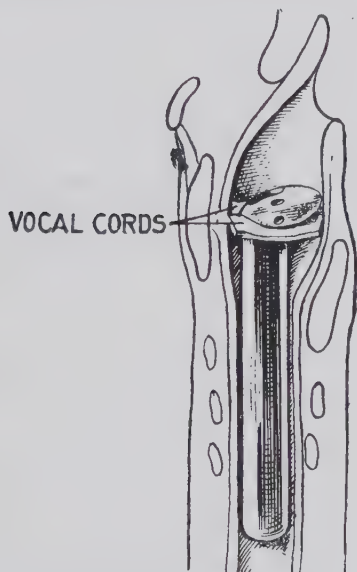


Fig. 166.—Tube, resting on vocal cords, in the larynx.

useless to try to rectify the position without first depressing the handle of the introducer as in the beginning of the operation, because, owing to the length of the tube, the palate arrests the upward movement before the distal extremity reaches the level of the glottic opening.

In croup the ventricles of the larynx are usually obliterated by swelling of the tissues and covered over by the pseudo-membrane, and therefore seldom offer any obstacle to the passage of the tube on the first introduction; but when the stenosis persists longer than usual and reintroduction becomes necessary, it is well to remember that this may be a source of obstruction. The

tube once having entered a ventricle, a moderate amount of force is all that is necessary to make a false passage. I have known this accident to occur when the operator was unconscious of having used any force whatever. If the patient's head be thrown too far back, the tube may also be arrested by coming into contact with the anterior wall of the larynx or trachea.

An accident, which fortunately is very rare, is the pushing of membrane downward. In this condition stenosis will not be relieved. In such cases it is advisable to extubate at once, and to reintubate by using one of the specially constructed tubes.

EXTUBATION.

The nervous frightened child must be quieted, especially when considering extubation. I usually order an antispasmodic for twelve hours preceding the removal of the tube. Codeine, $\frac{1}{4}$ grain or $\frac{1}{3}$ grain to a child 2 years old or older, is repeated every three hours for four doses, or 10-grain doses of sodium bromide, with 2 grains of chloral hydrate, repeated in six hours—two doses only—will allay nervous excitability and have a quieting effect. Antispasmodics should be continued for twenty-four hours after removal of the tube. The spasm due to fear of the operating table when repeated intubation and extubation is practiced may in rare cases require the inhalation of a few drops of ethyl chloride prior to extubation. Dover's powder is a valuable drug as an antispasmodic.

How to Extubate.—First step in the operation: Place gag in position; locate the tube with the left index finger; guide the extractor along the finger until the beak enters the lumen of the tube. Second step in the operation: Depress the handle of the extractor to hold tube firmly, and withdraw the tube slowly. (See Plate XLVII.)

When to Extubate.—Five days is a fair length of time for the tube to be left in the larynx. The following rules have served me best in a very large experience in hospital and private practice:—

Let the child's condition be the guide as to when to extubate. My advice is to leave the tube in the larynx at least *four* days, then remove the same.

The question to be considered is, Can the child undergo the shock of extubation, and, if need be, reintubation?

If the temperature is over 100° F., and the pulse-rate is small, rapid, and over 120, it is better to wait with the extubation.

A rubber tube left in the larynx does not have calcareous deposits as we find them on the metal tubes; hence there is no danger in leaving a rubber tube *in situ* for several weeks.

If the tube is plugged with mucus or membrane it may be necessary to remove the tube and clean it. A rattling or crowing sound in addition to laryngeal stenosis usually indicates this condition.

At the Willard Parker Hospital there is no definite rule as to the number of days a tube remains in the larynx. Individual conditions govern the time of extubation. In some cases tubes are

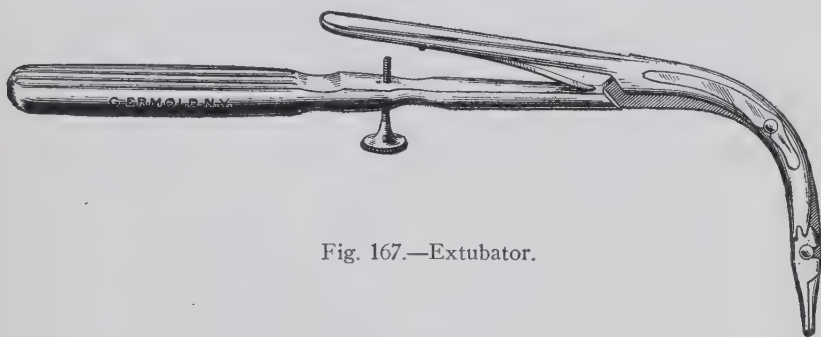


Fig. 167.—Extubator.

removed after forty-eight hours. The severity of the cases admitted to the hospital and the complication must be taken into consideration. Uncomplicated cases may be extubated any time between the third and seventh days when the edema of the larynx subsides. In a few instances the child expels the tube without having recurring stenosis. This auto-extubation is occasionally seen; it is Nature's method of removing a foreign body after the subsidence of the inflammatory condition.

Specially Constructed Tubes (see Fig. 169).—*Caliber tubes*, made of metal, also known as *foreign-body tubes*, have a much wider lumen than the ordinary tubes used for intubation. They are also shorter. Through these tubes large membranes are frequently expelled. There are instances, however, where large pseudo-membranes extend into the trachea to the smallest ramifications of the bronchi. Violent coughing paroxysms frequently dislodge these membranes, so that *distinct casts of the trachea* and its bifurcation can be plainly made out. Several of these casts

were seen by me during my service at the Willard Parker Hospital.

Intubation in Chronic Stenosis of the Larynx.—O'Dwyer's rules and indications for the performance of intubation in chronic laryngeal stenosis are as follows: (1) Cicatricial stenosis, due

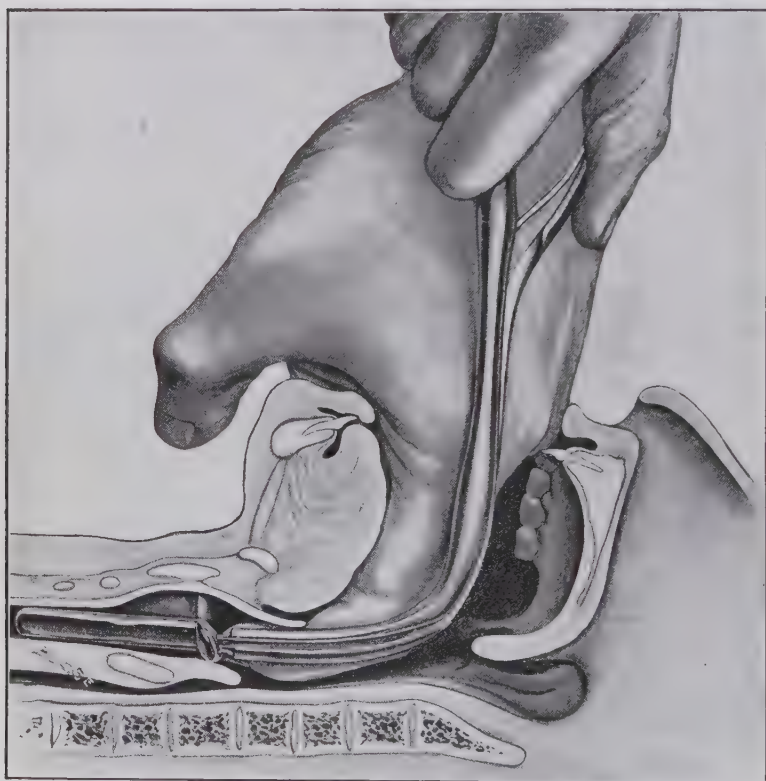


Fig. 168.—Extubation. The left index finger finding the tube. The beak of the extractor guided into the opening of the tube before removal of the tube.

to injury to the soft parts from syphilis, irritants, and traumatism. (2) Narrowing of the space both below and above the vocal bands from the products of chronic inflammation—simple, tuberculous, specific, malignant, or otherwise, and including such conditions as the so-called pachydermia laryngis, and corditis vocalis inferior hypertrophica. (3) It is especially valuable in cases in which tracheotomy has been performed, and, when the



Extubation. First step. Gag in position. Extractor is guided along the left index finger until the beak enters the lumen of the tube.



Extubation. Second step. The beak of the extractor holding the tube firmly; the operator withdraws the tube.

tracheal cannula having been worn for a considerable length of time, the upper part of the trachea is filled with granulations and the laryngeal muscles have become weakened from disease. In this condition intubation has effected many brilliant cures. (4) In papilloma of the larynx it has been found helpful in a fair proportion of cases, although its results in this disease are less satisfactory than in most others in which it has been employed. (5) Deformities of the larynx from injury or disease of its cartilaginous framework, which have resulted in constriction of the



Fig. 169.—Built-up tubes for granulation tissue. Useful for treatment of “retained tubes.”

caliber of the organ, have been cured by it. (6) It has also been used, with excellent results, in ankylosis of the crico-arytenoid articulations, and in arthritis deformans of the same part. (7) It is useful in various affections of the nerves of the larynx; for instance, in hysterical contraction of the abductors, “aphonia spastica.”

The Tolerance of the Larynx for the Intubation Tube.—When the intubation tube is retained because of recurring laryngeal stenosis we are confronted with a serious problem. During my service at the Willard Parker Hospital I have seen children wearing tubes five, ten, and fifteen years. They could not breathe without the same. To wean the larynx from the tube we must get the child in a good physical condition, and prepare it as though it were to undergo a major operation. It should be given

concentrated food, such as the yolk of egg added to broth, rice pudding, meat juices and vegetables.

When the child is in good condition tracheotomy should be performed and the laryngeal tube removed by extubation. Laryngeal dilatation should then be instituted until the stenosis disappears. Such dilatation can only be done by one well versed in the treatment, and preferably with the aid of a bronchoscope.



Fig. 170.—Gavage. Method used in forced feeding at the Willard Parker Hospital.

Of a series of cases under treatment at the Willard Parker Hospital such dilatation of the larynx was successfully accomplished. Such cases require hospital care and many months of persistent treatment to relieve the condition.

Ulcerations due to the intubation tube have been seen by me:—

- (1) In the cricoid division of the larynx, just below the vocal cords.
- (2) At the base of the epiglottis, from pressure during the act of swallowing.

- (3) On the anterior wall of the trachea near the distal end of the tube.

Ulcerations resulting from an intubation tube have been seen by me post-mortem in children that were fed by gavage. I have also seen ulceration where children were fed by the natural methods. I believe that feeding with the swallowing movements incidental to the same produces ulceration at the lower end of the tube, because of the up and down riding of the tube.



Fig. 171.—Casselberry method of feeding.

A post-mortem specimen of larynx and trachea was recently examined by me at the Willard Parker Hospital. The child was in the hospital twenty-one days. It was a case of acute laryngeal stenosis. Three ulcerations existed at the cricoid cartilage and nine other ulcerations existed at the distal end of the tube.

Feeding After Intubation.—Various methods of feeding are in vogue, and each clinical observer seems to be satisfied with his particular method. Whenever possible we should try to resort to the usual mouth feeding. I invariably feed semi-solid food, such as bread soaked in milk, custard, junket, cornstarch or rice pud-

TABLE No. 46.—SERIES OF HOSPITAL CASES.

| No. | Name. | Sex. | Time of Patient in Hospital. | Kind of Feeding. | Age. | No. of Antitoxin Units Used. | When Intubated. | No. of Intubations. | Recent Examination at the age of | Condition of Throat. | Condition of Chest. | General Condition. |
|-----|------------|------|------------------------------|------------------|--------|--|---------------------|---------------------|----------------------------------|--|---|--|
| 1 | Celia M. | F. | 30 days | | 3 yrs. | 6000 units N. Y. Dept. of Health | 2d day of illness | 1 | 10 yrs. | Enlarged Tonsils, Chronic Pharyngitis | Slightly pigeon-breasted | Rachitic, anemic. |
| 2 | Ida S. | F. | 44 " | | 4 " | 2000 units N. Y. Dept. of Health | 4th day of illness | 1 | 7 " | Enlarged Tonsils, Pharyngitis | Rachitic, Harrison's groove, beaded ribs, funnel-shaped depression, pigeon-breast | |
| 3 | Nathan L. | M. | 26 " | | 3 " | 3000 units N. Y. Dept. of Health | 2d day of illness | 1 | 6 " | Rhinopharyngitis | Slight rachitis | General condition fair. Subject to dyspnoeic attacks. Following year had measles and croup, influenza and bronchitis lately. |
| 4 | Albert R. | M. | 15 " | | 3 " | 2000 units N. Y. Dept. of Health | 2d day of illness | 1 | 6 " | Enlarged Tonsils, Adenoids, Pharyngitis | Rachitis | Lymph nodes enlarged. Otitis, left ear. Rachitis. Measles and bronchitis after discharge. |
| 5 | Abie A. | M. | 37 " | | 2 " | 2000 units N. Y. Dept. of Health | 3d day of illness | 1 | 5 " | Tonsillitis hypertrophic, Rhinopharyngitis | Harrison's groove, beaded ribs | General condition fairly good. Measles shortly after convalescence. Mild attack of croup two years later. Dyspnoea at times, due to catarrh. |
| 6 | Hugh L. | M. | 17 " | | 5 " | 2000 units N. Y. Dept. of Health | 9th day of illness | 1 | 8 " | Enlarged tonsils, Pharyngitis | Chest well developed | General condition good. Has an occasional cough. |
| 7 | Sammy S. | M. | 18 " | | 6 " | 2500 units N. Y. Dept. of Health | 5th day of illness | 1 | 12 " | Enlarged tonsils, Pharyngitis | Excellent, no rickets | General condition good. Well nourished boy. Mild throat symptoms. Is subject to colds. |
| 8 | Patrick R. | M. | 19 " | | 4 " | 2800 units N. Y. Dept. of Health | 14th day of illness | 4 | 10 " | Had tonsils removed after leaving hospital | Mild rachitis | cervical lymph nodes removed after leaving hospital |
| 9 | Henry R. | M. | 9 " | | 8 mos. | 1500 units N. Y. Dept. of Health | 4th day of illness | 1 | 6 3/4 " | Enlarged tonsils, Pharyngitis, Coryza | Rachitic funnel-shaped thorax | One year later had pneumonia. |
| 10 | Max L. | M. | 29 " | | 1 year | 1600 (dry) units 1000 (filtered) units N. Y. Dept. of Health | 2d day of illness | 3 | 7 " | Enlarged tonsils, Post-nasal catarrh, Adenoids | Rachitic, Harrison's groove, carious teeth | Since leaving hospital, pneumonia, laryngitis and strabismus. Returned after five years with mild diphtheria. (No intubation). |

All Breast-fed.

ding, soft-boiled eggs, if the child's age warrants it; also concentrated soups and broths, calfsfoot or chicken-jelly, water ices and ice cream. These articles of food I have found best adapted for tube cases based on a very extensive experience in hospital and consultation practice.

In very young infants, breast or bottle fed, great care should be exercised with the feeding. If a breast-fed child refuses to nurse, the breast-milk can be pumped off and the infant fed every three or four hours by spoon.

My advice in intubated cases: Use natural methods of feeding—do not use gavage—choose simple ways. Rectal feeding may be tried if vomiting occurs.

The Casselberry method of feeding consists in laying the child flat on its back across the nurse's lap, with the head below the level of the body. By this means we avoid introducing liquids into the larynx.

Mamie B., 2 years old, was seen by me through the courtesy of the attending physician on the second day of her illness. There were patches of diphtheria visible on the pharynx and tonsils. The temperature was $101\frac{1}{2}^{\circ}$ F., pulse 140. There was also laryngeal involvement noticeable by the croupy cough. An injection of 3000 units of antitoxin was first given. The colon was flushed and the bowels thoroughly emptied. A dose of calomel was given and milk and albumin water was ordered for the diet.

Nasal irrigations of saline solution were ordered every two hours. An ice-bag was applied to the neck. On the third day the temperature rose to 102° F., pulse 130, respiration 36. Breathing labored—considerable retraction of the chest—cough very croupy. Large quantities of mucus were expectorated. The pulse was 146, respiration 40. Stimulation was demanded and 1 dram of whisky was given every hour. Laryngeal stenosis was so severe that a hurry call was sent to me to intubate. The child was quickly intubated. A No. 3 rubber tube having a coating of gelatine and alum was inserted. The stenosis was immediately relieved. The child appeared comfortable and fell asleep. Six hours after the intubation the temperature was 103° F., pulse 140, respiration 40. Cold sponging was ordered and, owing to severe coughing when liquids were given, semi-solids were ordered while the intubation tube was *in situ*. On the following day the temperature dropped to 101.6° F., and on the third day after intubation the child was practically normal. The tube was left in the larynx five days, and as soon as the temperature dropped to 99° F. the child was extubated. The patient made an uneventful recovery. No complications followed. I might add that the usual rule of administering 15 grains of bromide of sodium or $\frac{1}{2}$ grain of sulphate of morphine, as an antispasmodic, one hour before extubation was not given in this case.

TABLE No. 47.—SERIES OF PRIVATE PRACTICE CASES.

| No. | Name. | Age. | Sex. | Location of Membrane. | No. of Anti-toxin Units Used. | Time of Intubation. | Day of Discharge. | Tube Retained. | No. of Intubations. | Condition of Throat. | Complications. | Results. |
|-------|---------|------|------|--------------------------|-------------------------------|---------------------|-------------------|----------------|---------------------|---|-----------------------------|------------------------------|
| 1 W. | 2 yrs. | M. | M. | Pharynx, tonsils, larynx | 2500 units | 2d day | 4 1/2 days | 1 | Tonsils enlarged | Pharyngitis, tonsillitis | None | Cured |
| 2 R. | 2 " | F. | F. | Pharynx and larynx | 3000 " | 3d " | 26 " | 4 | 4 | | Septic case, epipharyngitis | Cured |
| 3 S. | 5 " | F. | F. | Larynx | 3000 " | 5th " | 14 " | 2 | 2 | Tonsils enlarged | None | Cured |
| 4 R. | 3 " | M. | M. | Pharynx, tonsils, larynx | 2000 " | 2d " | 12 " | 3 | 3 | Chr. pharyngitis, hypertrophied tonsils | None | Cured |
| 5 K. | 4 " | M. | M. | Pharynx and larynx | 2000 " | 3d " | 5 " | 5 | 1 | Hypertrophied tonsils | None | Cured |
| 6 A. | 5 " | M. | M. | Pharynx tonsils, larynx | 2000 " | 2d " | 5 " | 5 | 1 | Hypertrophied tonsils | Bronchitis | Cured |
| 7 D. | 4 " | F. | F. | Pharynx, uvula, larynx | 2500 " | 3d " | 6 " | 6 | 1 | Adenoids, hypertrophied tonsils | None | Cured |
| 8 B. | 3 " | M. | M. | Pharynx and larynx | 2000 " | 3d " | 5 " | 6 | 1 | Hypertrophied tonsils | None | Excellent |
| 9 R. | 3 " | M. | M. | Pharynx, tonsils, larynx | 4000 " | 2d " | 6 " | 6 | 1 | Adenoids, hypertrophied tonsils | None | Excellent |
| 10 A. | 3 " | M. | M. | Pharynx and larynx | 2000 " | 3d " | 6 " | 6 | 1 | Hypertrophied tonsils | Measles | Coughed up tube. Asphyxiated |
| 11 S. | 4 " | F. | F. | Pharynx, tonsils, larynx | 3000 " | 2d " | 7 " | 7 | 1 | Hypertrophied tonsils, pharyngitis | None | Excellent |
| 12 K. | 2 " | M. | M. | Tonsils, uvula, pharynx | 2500 " | 3d " | 5 " | 5 | 1 | Adenoids, hypertrophied tonsils | None | Excellent |
| 13 G. | 3 " | F. | F. | Pharynx, tonsils, larynx | 1500 " | 2d " | 5 " | 5 | 1 | Hypertrophied tonsils | None | Cured |
| 14 L. | 2 " | M. | M. | Larynx | 1500 " | 1st " | 22 " | 22 | 5 | Hyper. tonsils, chronic rhinopharyngitis | Br.-pneu. | Cured |
| 15 L. | 3 " | M. | M. | Pharynx and larynx | 2000 " | 3d " | 14 " | 14 | 3 | Enlarged tonsils | None | Cured |
| 16 O. | 5 " | M. | M. | Pharynx and larynx | 2000 " | 2d " | 5 " | 5 | 1 | Adenoids, hypertrophied tonsils | None | Cured |
| 17 C. | 3 " | M. | M. | Pharynx, tonsils, larynx | 3000 " | 3d " | 5 " | 5 | 1 | Chr. pharyngitis, chr. tonsillitis, vegetations | None | Cured |
| 18 H. | 4 " | M. | M. | Pharynx, larynx, tonsils | 3000 " | 2d " | 5 " | 5 | 1 | Hyper. tonsils, adenoid vegetations | None | Cured |
| 19 S. | 3 " | F. | F. | Pharynx and larynx | 2000 " | 3d " | 6 " | 6 | 1 | Hypertrophied tonsils | None | Cured |
| 20 P. | 4 " | F. | F. | Pharynx and larynx | 3000 " | 2d " | 25 " | 25 | 5 | Rhinopharyngitis, hyper. tonsils | None | Cured |
| 21 B. | 5 " | F. | F. | Pharynx, tonsils, larynx | 2000 " | 3d " | 6 " | 6 | 1 | Chronic tonsillitis, adenoid vegetations | None | Cured |
| 22 M. | 4 " | F. | F. | Larynx | 3000 " | 5th " | 6 " | 6 | 2 | Hypertrophied tonsils, adenoids | None | Cured |
| 23 R. | 11 mos. | F. | F. | Larynx and tonsils | 1500 " | 2d " | 7 " | 7 | 1 | No adenoids or enlarged tonsils visible | Br.-pneu. | Excellent |
| 24 G. | 4 " | F. | F. | Larynx, tonsils, pharynx | 2500 " | 3d " | 5 " | 5 | 1 | Enlarged hypertrophied tonsils | None | Cured |
| 25 C. | 4 " | M. | M. | Pharynx, tonsils, larynx | 4000 " | 2d " | 12 " | 12 | 3 | Hyper. tonsils, granular pharyngitis | None | Cured |
| 26 K. | 2 " | F. | F. | Tonsils, pharynx, larynx | 3000 " | 2d " | 6 " | 6 | 1 | Adenoid vegetations, hyper. tonsils | None | Cured |

Intubation has, in America, entirely replaced tracheotomy for the relief of acute laryngeal stenosis. Rubber tubes are used exclusively for intubation. The old metallic tubes have long ago been discarded. Tracheotomy is used as a secondary operation, usually to cure "retained tubes." When laryngeal stenosis persists and the patient cannot get along without the tube, then a tracheotomy is frequently resorted to.

Jennings, of Detroit, with an equally large experience, says that he has never met with the severer forms of the difficulty, but that in two or three instances he has had to continue the intubation as late as the third week after the first insertion, before recovery was complete. His associate, Shurley, has never had any trouble with delay in the removal of the tube. Galatti, in the article above referred to, states that he had 2 chronic stenoses in 31 intubations. He reports Ranke as having had 1 case in many hundred; Heubner, 1 in 250, and Bókay, 2 in 800. McNaughton, of Brooklyn, says that he has had but few cases in many hundred, and these recovered at the latest within several weeks.

Causes of Recurring Stenosis.—Emil Köhl, in his inaugural address at Zurich, described very fully the pathological condition of the larynx in cases of chronic postdiphtheritic stenosis with retained tracheal cannula. This article demonstrates most conclusively that not the least frequent cause of the difficulty is a chronic hypertrophic, subglottic laryngitis, a chronic thickening of the soft parts between the vocal cords and the lower border of the cricoid cartilage. The hypertrophy of the soft tissue was so marked that respiration, except through tracheal fistula, was impossible. These cases, of course, had never been intubated; and, therefore, the chronic inflammation within the larynx cannot be charged to the irritation or traumatism consequent upon the insertion or wearing of an intubation tube.

Another and more frequent cause of the stenosis was shown to be granulations and cicatrices in the neighborhood of the tracheal wound or cannula. And the nearer the cannula was to the vocal cords the worse were these complications. The vicinity of the upper end of the wound was more prone to granulations and cicatrices than the lower, as the upper end generally was involved or was close to the larynx, where the mucous membrane is more loosely attached than below. This bears upon the cause of the stenosis described in some of the reported cases of retained tubes which have finally been tracheotomized. If the

tracheotomy has existed long enough, it, and not the original intubation, may have given rise to the cicatricial tissue.

Incidentally, it may be noted that the number of devices described by Köhl for remedying a postdiphtheritic stenosis will illustrate the difficulties in the way of successful treatment other than by intubation.

In speaking of the operative treatment of stenosis of the larynx following intubation and tracheotomy, Arthur B. Duel says: The important points to remember: (1) About 1 per cent. of all patients intubated for acute laryngeal stenosis will be chronic tube cases. (2) The cause of the retention is due, in the majority of cases, to chronic inflammation of the intralaryngeal mucous membrane and hypertrophy of the subglottic tissues, and is not, as has been generally supposed, the result of granulation, ulceration, or cicatricial bands. (3) Autoextubation in these cases is the rule, and adds greatly to the danger where an experienced intubator is not at hand. As a result of this a large number of such cases are tracheotomized for safety. (4) Where high tracheotomies are done, cicatricial bands are almost certain to form in the trachea or lower part of the larynx above the tracheotomy wounds.

The points in treatment which should be emphasized are: (1) The largest sized tube possible should be inserted, under an anesthetic. In case of contraction, rapid dilatation should be done by beginning with the small sizes and working up to the large special tube, which is to be left in place. This special tube should be as large as can be inserted, and the constriction below the neck only $\frac{1}{32}$ inch smaller than the retaining swell. (2) This tube should be left in, undisturbed, for six weeks at least. It should then be removed, and, if a cure has not been accomplished, it should be replaced for six weeks longer.

The smooth rubber tube with or without metal lining is now generally used for the relief of laryngeal stenosis. Smooth rubber tubes, with a retaining swell, the advantage of the same over the metal tube in not having calcareous deposits after being worn for weeks, are certainly of advantage. The corrugated rubber tubes which were introduced by me several years ago have served me very well in many cases of "retained tube."

The following case of recurring stenosis is interesting. The child was about 4 years old, and had suffered for several years with hypertrophied tonsils and adenoid vegetations, in addition to chronic pharyngitis. The

family physician advised the parents to have the throat operated owing to the danger of infection with diphtheria. This prophylactic measure was not carried out. I saw the case on the second day of illness, in consultation, and found diphtheria involving the pharynx and tonsils which spread very rapidly to the larynx. The same day intubation was required to relieve a severe stenosis. The stenosis was so severe when I saw the child, and the pulse so weak, that it required a rapid introduction of the tube to afford relief. An injection of 3000 units of antitoxin was given. Three days later a second injection of 3000 units was made; so that 6000 units were injected in all. There was recurring stenosis when the tube was removed. It was necessary to intubate within ten minutes. Extubation was performed once every five days, and reintubation was necessary a few minutes to one-half hour after removing the tube. Rubber tubes only were used in this case. After the second intubation an alum gelatine film was used on the tube.

After the third intubation it was deemed necessary to use a corrugated tube dipped in a solution of hot gelatine containing 3 per cent. of ichthyol and alum. This tube was worn about five days. After the extubation the child breathed well for about one hour without a tube. A mild form of stenosis was noticed and it was deemed safe to reintubate with an ichthyol alum gelatine film on a No. 4 corrugated rubber tube. This tube remained about six days and was then removed. Stenosis did not recur and the case was discharged cured. Later on the adenoids and hypertrophied tonsils were removed and the child has been well since.

In the early stage of this class of cases the dyspnea returns slowly; sometimes several days, or in some instances only a few hours, may pass before the former condition of laryngeal stenosis is recognized and the necessity for the introduction of a proper tube is apparent.

When the dyspnea returns slowly, it means that the lining membrane of the larynx cannot swell while the tube is in position because it is compressed between the tube and the cartilage. It requires some time for the reappearance of the edematous tissue, which drops into the chink of the glottis and obstructs the respiration, the latter condition being mechanically prevented as long as the tube was *in situ*. Exceptional cases have been reported where granulation tissue springs up from the antero-lateral aspects of the larynx just above the ventricular bands. O'Dwyer states that the origin of this growth is a slight ulceration or erosion of the mucous membrane at the points corresponding to the greatest transverse diameter of the shoulder of the tube from the pressure exerted during the act of swallowing.

Paralysis of the vocal cords, although known to exist, is very hard to diagnosticate without a proper laryngoscopic examina-

tion. Like other forms of paralysis it comes very late in the course of the disease, and if, after wearing an intubation tube for a short time, laryngeal stenosis recurs, it is safe to assume that paralysis of the vocal cords is not the cause of the immediately recurring stenosis.

False Passage.—Repeated forcible attempts at intubation will lacerate the tissues. It is not infrequent to enter the ventricles of the larynx, producing a false passage by such forcible attempts at intubation. If a false passage has been produced, then laryngeal stenosis will not be relieved, and it is much wiser, if an expert intubator cannot be found, to immediately resort to tracheotomy. The great danger of collapse due to heart failure must always be remembered; hence it is advisable that the operation, be it intubation or tracheotomy, should be done quickly, thus lessening shock.

DIRECT LARYNGOSCOPY.

The direct method of inspecting the larynx requires experience. There are very many laryngologists who use this method in the treatment of neoplasms in laryngeal tuberculosis and in the local treatment of syphilitic ulcerations. Papillomata can be easily removed by means of direct illumination of the larynx. One of the greatest benefits, however, consists in the direct examination of the larynx in children, in laryngeal croup. When membrane is present, intubation is required. If membrane is not visible intubation can be postponed. This is of especial value in croup complicating measles, likewise in ordinary laryngeal croup of a non-diphtheritic character.

CHOICE BETWEEN INTUBATION AND TRACHEOTOMY.

In cases where operation is indicated it may be said that intubation has steadily grown in favor, and its advantages, when it is indicated, are so obvious as to require no recapitulation here. On the other hand, conditions are sometimes present that render intubation impracticable or inadmissible, or at least render tracheotomy preferable. It is therefore desirable to keep clearly in mind the factors that determine the choice in favor of one or the other of these operations. This subject has received consideration in a study of 4033 cases of diphtheria, observed at the

Kaiser and Kaiserin Friedrich Kinderkrankenhaus, in Berlin. As a result of this analysis it is concluded that operative intervention in cases of stenosis of the larynx of slight and moderate degree should be obviated as far as possible by means of anti-toxin and the employment of sprays. Primary intubation is indicated in all cases of stenosis of the larynx of severe degree in which, so far as the clinical picture makes it appear possible, a cutting operation can be avoided. Primary tracheotomy is indicated in the presence of asphyxia and collapse, of pneumonia, of severe heart disease, of paralysis of the palate and diaphragm, of profound anatomic changes in the pharynx, as well as marked tumefaction of the entire pharyngeal structures when necrotic.

Secondary tracheotomy is indicated when the symptoms of stenosis persist in marked degree with the tube in place, provided its lumen is not occluded, when pneumonia complicates, and when paralysis of the palate and diaphragm supervenes. Intubation is not recommended in nursing infants by some writers on account of the diminutive parts and of the narrow lumen of the larynx, but especially on account of the increased difficulty in feeding from the presence of the tube, which at this time of life is of vital importance. My personal experience is just the reverse, and my results have been excellent.

TRACHEOTOMY (IN ACUTE OR SUBACUTE LARYNGEAL STENOSIS).

If laryngeal stenosis persists in spite of intubation, then secondary tracheotomy is indicated. When extensive edema of the larynx exists, in which case intubation fails to relieve, tracheotomy may be required. I have frequently met surgeons who were well posted on tracheotomy, but were not familiar with the delicate *modus operandi* of intubation.

If laryngeal stenosis threatens life, and the physician is not acquainted with the method of intubation, then by all means perform tracheotomy, rather than risk "experimental intubation."

Emergency Tracheotomy.—When an emergency arises such as a laryngeal stenosis caused by the swallowing of a caustic material such as an acid or an alkali like ammonia, then no time should be lost. If stenosis exists an emergency tracheotomy should be performed. When the life of a child is at stake sterilization of instruments and asepsis should be dispensed with and the trachea

opened without delay. The following case of laryngeal stenosis was described by the late George F. Shrady.

A child suffering with croup suddenly collapsed and was thought dead, when Shrady, in the emergency, took a razor which was handy and made an incision into the trachea. He used a bent hairpin instead of a tracheal dilator. The child breathed as soon as oxygen was admitted. The case recovered.

TRACHEOTOMIES PERFORMED (WILLARD PARKER HOSPITAL, 1911) WITH DAY OF DISEASE AND NUMBER OF DAYS TRACHEOTOMY TUBE REMAINED IN THE LARYNX.

| | |
|---|---|
| Total number of tracheotomies performed | 4 |
| Tracheotomized on first day of disease | 3 |
| Tracheotomized on second day of disease | 1 |
| Tracheotomy tube remained in larynx one day | 1 |
| Tracheotomy tube remained in larynx two days | 2 |
| Tracheotomy tube remained in larynx four days | 1 |
| Result, 3 deaths; 1 recovery. | |
| Tracheotomies performed before admission | 2 |

The Operation.—*Anesthetic*: If time permits, a few drops of chloroform should be given. If septic stupor exists then no anesthetic should be given.

The high operation, "tracheotomie superieure," in which the incision is made in the upper portion of the trachea, is preferred to the lower operation, advised by Trousseau, known as "tracheotomie inferieure."

The upper portion of the trachea is quite superficial and it is best to make an incision, exactly in the *median line*, at least two inches in length. It is important to remember that the branches of the inferior thyroid veins are immediately under the place chosen for the operation; hence the parts must be carefully dissected with a blunt instrument, such as the back of a scalpel, until the trachea is reached. If there is severe bleeding the veins should be seized with a forceps unless emergency demands rapidity of action. The dissection should be continued until the trachea is reached. When there is considerable oozing of blood, and our view is thus obstructed, we must remember to keep in the center of the throat, which invariably brings us to the rings of the trachea. By placing the finger in the wound we will feel the respiratory movement of the trachea. When the trachea is reached it should be hooked up with a tenaculum and an incision made large enough to admit the tracheotomy tube. The rush of

air, so-called *tubal sound*, characteristic of intubation is also heard when tracheotomy is properly performed.

After-effects of the Tracheotomy Tube.—The presence of the tube in the trachea invariably excites cough. This expels loose membranes and other viscid accumulations. High fever sometimes follows this operation, although as a rule the temperature will only reach 101° or 102° F.

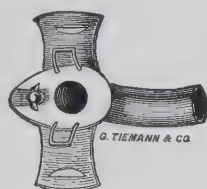


Fig. 172.—Silver trachea cannula used in tracheotomy.

The pulse-rate should be carefully observed; a gradually increasing pulse-rate during the first three days after the operation is a very bad sign.

Complications.—Bronchopneumonia and nephritis are to be feared, for they frequently terminate fatally. The treatment of

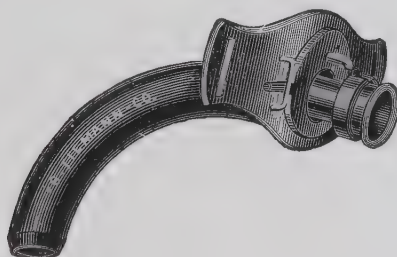


Fig. 173.—Hard-rubber trachea cannula.

complications is the same as though the disease existed independent of the operation.

After-treatment.—Careful aseptic methods must be the rule from the moment the child's stenosis is relieved. The infection of the wound will always be an added source of danger. As the majority of cases of tracheotomy will be performed for extensive pseudo-membranous stenosis, we must remember that septic diphtheria *per se* may cause death independent of the added danger incident to the opening of the trachea.

To Check Hemorrhage.—All oozing of blood must be checked; pressure with sterile gauze saturated with Monsell's solution has served me well. I have also used gauze dusted with a powder consisting of:—

| | |
|--------------------|---------|
| R Boric acid | 7 parts |
| Alum | 3 parts |

The local application of adrenalin solution, 1 to 5000, is very valuable during the operation, or gauze saturated with thromboplastine solution is an excellent local hemostatic.

The internal cannula should be removed and cleansed every two or three hours, wiped dry and replaced. In rare instances it may be necessary to cleanse the cannula more frequently. This can best be determined by watching the respirations and instructing the trained nurse as to when the caliber of the tube requires cleansing. Noisy, rattling sounds due to the presence of mucus in the tube do not necessarily mean that the cleansing of the cannula is urgent, if the child is quiet or asleep. If the child is restless and turns its head from side to side, and usually mucous rattling is heard in addition, then it is an indication for cleansing the tube.

Cleansing the Wound.—Each day following a tracheotomy, it is advisable to place the child on the operating table, withdraw the tracheotomy tube and replace it with a new one.

VI.

RUBELLA (RÖTHELN, GERMAN MEASLES, FALSE MEASLES).

THIS exanthematous eruption simulates measles. It is characterized by an eruption crescentic in character, chiefly confined to the face, neck, and body. In outline it resembles a net of lace work. The eruption is macular, rarely papular.

The period of incubation is usually from 10 to 18 days rarely longer. In New York City we exclude children having rubella from school for 5 days to 1 week. Children so affected will then be readmitted on a physician's certificate. Children in the same family attending school may continue to do so if they have had rubella.

Etiology.—While we have no exact knowledge of the cause of the disease and in what respect the virus differs from that of other diseases to which it bears the closest resemblance, yet we do know that it is contagious, and always gives rise to a like disease: in short, conforms to the type.

It occurs but once in the individual, from which we infer that it is self-protective, while it affords no protection to or modification of measles or scarlatina; nor has it appeared that they offer any protection against rubella. It must be remembered, moreover, that even mild forms of the various exanthemata are self-protective. The fact that the patient has had at some previous time either scarlet fever or measles, or both of these affections in a well-marked degree, often leads to its recognition. Sometimes, even before its true nature has been definitely settled in the mind of the medical attendant, the disease disappears.

Like the other exanthemata, it always appears in the form of an epidemic, which seems to bear little or no relation to epidemics of other diseases, such as scarlet fever or measles.

Bacteriology and Pathology.—Owing to the mild character of the disease, the pathological changes have not been studied. There are certain changes seen in the skin, described by Thomas. Nothing definite, however, can be stated. Bacteria in the blood of children suffering with rubella have been described by several authors; these are by no means pathognomonic of this condition.

It sometimes occurs independently; again, two or more of the epidemic exanthemata may prevail at the same time. It must be admitted that extraneous conditions of weather and possibly of sanitation predispose in a like degree to all. Though epidemics of rubella seem to occur at less frequent intervals than do those of either scarlatina or measles, there can be no doubt that very many epidemics of rubella escape recognition, and are regarded as mild or aberrant forms of one or the other of the first-named affections. While the author believes, with Atkinson, that unless more exact methods are adopted in the study of the exanthemata there is still danger of endless confusion, and that the practice of relegating all mild or otherwise anomalous forms of measles or scarlatina to rubella is, as it was formerly, far too prevalent; yet the remedy lies in giving to this important group of affections a more conspicuous position than it now holds in the curriculum of clinical instruction.

Symptoms and Diagnosis.—In most cases the symptoms are so mild that the child does not appear sick. The rash strongly resembles measles, but the characteristic sneezing, coughing, and suffused eyes with catarrhal conjunctivitis is absent. The temperature rarely rises above 102° F. Many cases will have a temperature of but 101° F.

The characteristic symptoms of rubella are swollen glands behind the ear (post auricular). They can be felt behind the sternocleidomastoid muscle. The throat is congested, tonsils and fauces reddened. There are no visible membranes. The characteristic enanthem in measles seen on the buccal mucus membrane is absent in rubella.

Forchheimer describes what he considers a characteristic enanthem in rubella which appears simultaneously with the exanthem and remains from 12 to 14 hours. Its favorable location is on the soft palate, sometimes extending to the hard palate. It consists of small discrete, dark red—but not dusky papules which soon disappear, leaving no trace behind. The rest of the mouth may or may not be congested.

Toxic symptoms, such as vomiting and convulsions, when present usually signify gastroenteric derangement and are the result of a complication rather than a symptom of rubella. The urine shows traces of albumin which disappear in a few days. Casts and red blood cells are seen only in toxic conditions. The lymphatic glands of the neck are the most striking symptoms

and will suggest a diagnosis of probable mumps until the eruption appears. The maxillary, superficial, or post cervical glands are the most frequently involved. Next in frequency are the occipital, posterior and anterior auricular. The glandular swelling precedes the eruption by two or three days in some cases. The tongue is coated and the papillæ may be enlarged. The characteristic strawberry tongue is absent. Suppuration of the glands is never observed. The spleen is hardly palpable and cannot be considered as swollen. In older children there are no subjective symptoms. They do not complain of headache or malaise. When the diet is restricted they complain of hunger. There is no photophobia, the ear does not give any inflammatory symptoms.

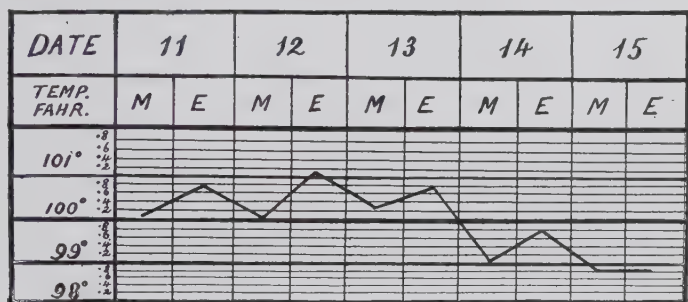


Fig. 174.—Temperature chart. Case of rubella.

In the pre-eruptive stage of real measles we frequently have croup and otalgia. In rubella there is neither croup nor earache. A fine mealy desquamation similar to measles is occasionally noted. It is more like a very fine flour (mealy desquamation). The fever remains two to four days. The pulse and respiration are slightly elevated. More than 50 per cent. of cases seen by me have an eruption on the face, neck and body, glandular swelling behind the ears, and a normal temperature.

In 39 cases the highest record was 101.4° F.

In 14 cases the highest record was 101.3° F.

In 6 cases the highest record was 102.2° F.

In 2 cases the highest record was 103.1° F.

Sometimes there is anorexia and occasionally nausea or vomiting. J. Lewis Smith describes convulsions seen in the disease. The temperature varies between 100° and 101° F., rarely higher. The tongue is not as thickly coated as in measles, although the

papillæ may be enlarged. These projecting papillæ appear on the tip of the tongue. The characteristic strawberry tongue is absent.

Sneezing may be present and coryza may be absent, or *vice versâ*.

Thierfelder states that swelling of the subauricular and superior jugular lymphatic glands may be looked upon as a constant prodromal symptom. Atkinson says enlargement of the superficial lymphatic glands of the neck may be the most striking symptom, and sometimes attracts attention several days before the beginning of the eruption.

Corlett says his cases show adenopathy in 96 per cent., of which the maxillary and superficial or post-cervical were the most frequently involved; next the occipital, posterior and anterior auricular; and sometimes the superficial inguinal, axillary, and the epitrochlear. In the neck the inflammation may be sufficiently severe to interfere with free movement, and in two or three instances it has given rise to marked edema of the surrounding parts. Suppuration of the glands is never observed. The lymphatic ganglia are also involved in the regions affected. The spleen is seldom involved.

Pauline M., 6 years old, was brought to my office in an apparently good condition. I was told that the child had a rash on her chest and back, and that the temperature was 100° F. in the rectum. There was sneezing, but no cough nor bronchial symptoms. There was an enlargement of the glands on both sides of the neck along the posterior border of the sternomastoid muscle. The buccal mucous membrane, pharynx, and tonsils were but slightly inflamed. The conjunctivæ were of a deep pink color. The rash was scattered over the abdomen and chest and was crescentic in its arrangement, similar to that seen in measles. The highest temperature reached was 101° F., in the evening, pulse was 100, and the respiration 24. The treatment consisted in giving a mild laxative and liquid diet. Strict isolation was insisted upon. The eruption remained about three days. The child recovered without any complication.

The Eruption.—The rash is first seen on the face and scalp. It is described as faint pinkish maculæ, at first discrete, but sometimes becoming more or less confluent within a few hours. The eruption spreads downward to the neck and upper part of the abdomen until the upper and lower extremities are covered. The palms and soles are usually associated in this general eruption. The eruption reaches its full development after one or two days. It spreads slowly and fades on the face when it is about

reaching its height on the lower extremities. Hardaway believes that this dissimilarity in the appearance of the eruption is a valuable means of distinguishing rubella from measles. The individual lesions are sometimes perceptibly elevated and vary in size from a pin-head to a small bean. They are often slightly elongated or irregularly round in shape, with an ill-defined border, and disappear completely on pressure. Unlike measles, they show no tendency to form groups, clusters, or crescents, and in some cases manifest a feebler predilection to coalesce. Sometimes, however, when confluent they extend at the periphery, coalesce, and form extensive areas, when the resemblance to scarlatina may lead to an error in diagnosis.

Usually the plaques thus formed are found only on certain parts, while on the remaining portions of the body the eruption presents the more usual appearance. The color is always lighter than that observed in scarlet fever, and in a strong light the slight elevations which correspond to the original lesions may be discerned. Further, the eruption is fairly uniform in color and may be described as of a faded rose, or pink tint, never, in my experience, presenting the fiery red of scarlatina nor the dusky, bluish red of measles.

Subjective Symptoms.—Children do not complain of illness. Were it not for the eruption one could hardly have a reason to keep the child in bed. After the second or third day it is almost impossible to keep the child confined. The temperature is normal and there are no complications.

Differential Diagnosis.—The following distinctive points are taken from Corlett:—

First.—That rubella is sometimes feebly contagious, while measles is always violently contagious.

Second.—The prodromal stage is always short and quite insignificant in rubella, while in measles it continues from three to four days.

Third.—In measles the prodromal stage is usually accompanied by marked constitutional symptoms, with catarrh of the upper air passages, lacrymation, photophobia, and a more or less characteristic eruption in the mouth, which appears from twelve to forty-eight hours before the cutaneous exanthem. In rubella no characteristic prodromata are observed, and only at the beginning of the eruptive stage is there usually a slight hyperemia of the conjunctivæ, of the faucial mucous membrane, and rarely

of the upper air passages. On the soft palate and uvula there is sometimes a punctate or faint macular enanthem, which by some is considered distinctive. Even in mild cases of measles the disturbance of the mucous membranes is more severe than in severe cases of rubella, and there is always, so far as I have observed, a bluish or skim-milk tint to the mucous membrane of the mouth, which I have never found in rubella. In rubella, sore throat is present in nearly all cases, while in measles sore throat is uncommon.

Fourth.—The eruption in rubella appears most frequently on the first and second day, rarely later. It often disappears from parts first attacked before other regions become involved. It is of a pale red or pinkish color, very rarely assuming a dusky tint, and the individual spots are surrounded by a faint areola, thus obscuring the outline of the lesion. The spots are papulomacular, for the most part round or slightly oval in shape, and present no tendency to form crescents or groupings. Sometimes by coalescing they unite to form extensive areas, which in all cases, either at the periphery or on more remote parts, are associated with the discrete, small macules which give character to the eruption. The rash rarely lasts longer than three days, and most frequently it disappears on the upper part of the body on the second; while in measles the eruption almost always appears on the morning of the fourth day, sometimes on the third, and rarely earlier. In measles the color is a dark or purplish red, and the lesions are well defined, with normal skin intervening. They enlarge at the periphery and show a marked tendency to form groups and crescents. These are especially marked on the face, neck, and upper part of the trunk. In all cases the individual lesions are larger than in rubella; so that the whole surface of the body may be involved at the same time, consequently, it remains longer than that of rubella, lasting from four to five days, or longer, when defervescence begins.

Fifth.—In rubella the superficial lymphatic glands of the neck are nearly always involved, being swollen and sometimes painful; while in measles marked or painful enlargement of the glands of the neck is decidedly uncommon.

Sixth.—In rubella the temperature may be only slightly above the normal at any time during the course of the disease, and it rarely exceeds 102° F. Nor is the temperature curve in any way characteristic of the affection. Further, it is usually of

short duration and rarely continues beyond the second or third day. In measles fever is always present and the temperature is sometimes high. There is an initial rise of temperature during the prodromal stage, which usually subsides, returning just previous to the appearance of the eruption, and attaining its maximum at the height of the efflorescence. The fever may continue until the seventh or eighth day.

Seventh.—Rubella is seldom accompanied by complications or followed by sequelæ, while in measles complications are common and constitute the most serious feature of the disease.

In studying the above we can readily see that measles is very frequently mistaken for rubella. Scarlet fever has a small punctate rash very uniform in character. The temperature, and the characteristic throat and tongue will usually differentiate this condition.

Syphilis is frequently mistaken for rubella, but the absence of the characteristic initial lesion will aid in establishing the true diagnosis. Before making a positive diagnosis we should see that our patient is not suffering from a drug eruption.

Complications.—These are rarely seen. The disease is so benign that it rarely leaves any after-effects. Recurring rashes have been described by various authors, hence, a *relapse* is possible. This second rash does not differ in character from the first. The contagious nature of this condition has been well established. Hatfield reports that of 196 children in an asylum, 110 were affected. Corlett believes that it is as contagious as measles, but the contagium retains its vitality longer and hence resembles scarlatina. The infectious nature of this disease has been studied by Edwards, who found that 75 per cent. of cases in an epidemic in Philadelphia could be traced to infection from the bunks of ships.

Course.—Rubella runs a mild course. Cases seen by me during an epidemic remained ill about three to four days, rarely five days. Some authors state that children with rubella are ill one and two weeks.

Prognosis.—This is always good. With good sanitary surroundings, aided by careful diet, recovery always takes place.

Treatment.—Owing to the contagious character of the disease children so affected should be isolated. A laxative is rarely necessary. A soap water enema, daily, to relieve the bowels may be required. Meat should be restricted, and a diet of milk,

vegetables, fruits, buttermilk and water should be given. As a rule cereals and all carbohydrates such as sugars should be excluded for a few days, as they sometimes cause itching. Tub baths may be given daily without any danger. When children are restless and irritable and do not sleep, a warm tub bath is soothing and should be repeated daily.

DUKE'S DISEASE (FOURTH DISEASE).

Many authors dispute the existence of a fourth disease, and maintain that abortive types of scarlet fever or abnormal types of rubella are the symptoms observed in so-called fourth disease.

The existence of a separate exanthematous eruption has been brought before the profession many times. As early as 1885, Filatow, a Russian, outlined the symptoms of a fourth disease.

The characteristic symptoms are an incubation period varying between nine and twenty-one days, thus resembling rubella. The eruption, according to Duke, is of an erythematous character and is seen on the face, especially involving the skin surrounding the mouth. There are no pharyngeal or tonsillar patches visible. The tongue does not show the characteristic strawberry appearance of scarlet fever. There is an absence of fever in most cases, and the active symptoms subside after two or three days. The lymph nodes in the neck, axilla, and inguinal region are palpably swollen. Following the eruption there is a fine, mealy desquamation.

In an extended experience at the large hospital for contagious diseases of New York City in addition to many hospitals abroad I have never satisfied myself that a separate, distinct, fourth disease exists. When a case of Duke's disease was pointed out to me, it always looked like an abnormal form of rubella or a mild form of scarlet fever. *Pathognomonic symptoms which would differentiate this disease from measles or scarlet fever were not present.* Until a more profound pathological study is made we must content ourselves with a study of the description of the disease as outlined by Duke.

VII.

EXANTHEM SUBITUM.

THIS disease was first described by Zahorsky¹ in 1910 as *roseola infantilis*, again in 1913 under the name of *roseola infantum*. The same eruption has been seen by many authors since that time.

Levy (Detroit) in 1919 also described this same macular eruptive fever. It is to Veeder and Hempelman² that credit is due for giving it a descriptive name which illustrates the pathological condition.

After several days of a continued fever, usually three or four days, there suddenly appears a rose colored macular eruption which disappears without any desquamation.

The disease affects infancy, rarely childhood. Its predilection for infancy is one of its special features. Thus far the absence of contagion is a striking feature.

Etiology.—This is undoubtedly a systemic infection as indicated by the fever, the exanthem and the blood count. Whether or no infection enters through the nose and throat or the gastro-enteric tract will remain for future observers to prove.

In one of my cases there was similarity to typhoid—the fever, macular eruption and the leucopenia suggested typhoid, when suddenly all symptoms vanished. A negative Widal, negative Diazo, and absence of continued fever disclosed the presence of exanthem subitum.

Symptoms.—There is a sudden onset of symptoms. In one case reported by Veeder, headache and malaise existed. In older children as a rule there are no prodromal symptoms. There are no symptoms except for the fever and the lassitude or depression produced by the high temperature. There is no vomiting, cough, diarrhea or pain, and the most careful physical examination has failed to discover any abnormal physical signs, such as congested ear drums, inflamed tonsils, swollen gums, lymphoid enlargement, chest or abdominal signs, or symptoms relating to the central nervous system. The post-cervical glands

¹ ZAHORSKY: *Pediatrics*, 2260, 1910.

² VEEDER AND HEMPELMAN: *Jour. Am. Med. Assn.*, December 3, 1921.

TABLE NO. 48.—BLOOD EXAMINATION.

| Case | Age | Day of Count | Temperature | White Blood Count | Lymphocytes | Polymorpho-nuclears | |
|------|---------|--------------|-------------|-------------------|-------------|---------------------|---|
| 1 | 10 yrs. | 4th | 105 | 3200 | 80 | 18 | Widal negative, blood culture negative. |
| 2 | 9 mos. | 3d | 104 | 3200 | 90 | 7.5 | |
| 3 | 10 mos. | 3d | 102.6 | 6000 | 88 | 11 | |
| 4 | 10 mos. | 2d | 103 | 7000 | 80 | 12 | |
| | | 5th | Normal | | 89 | 11 | Widal negative. Widal negative. |
| 5 | 14 mos. | 3d | 104 | 8600 | .. | .. | |
| 6 | 15 mos. | 3d | 103 | 6800 | 75 | 25 | |
| 7 | 3½ yrs. | 5th | Normal | 6600 | 28 | 72 | |
| 8 | 10 mos. | 3d | 102 | 6600 | 88 | 8 | |

are not enlarged. The urine has as a routine been negative. There is, as a rule, an absence of toxic symptoms and only moderate prostration. Despite the high fever, the children usually take their food well. As the fever falls to normal, the rash develops and immediately the infants seem and act as if entirely well. The absence of toxemia with the high fever is noteworthy.

Course.—There is a striking uniformity in the course of the disease. The fever, mounting abruptly to from 102° to 104° F. or more, remains high, with perhaps slight morning remissions until the fourth day, when, coincident with the appearance of the rash, it falls to normal by crisis and the child acts as if quite well again. Rarely, the temperature falls on the third or fifth day instead of the fourth. The maximum temperature has been 105° F., and there is a tendency for the fever to be 1 or 2 degrees lower in the morning than later in the day. Convalescence has been uneventful without exception.

The Rash.—The rash is the only characteristic lesion and is quite typical. It appears as the temperature falls, develops rapidly, reaching its height in about twelve hours, and then fades in another twenty-four to forty-eight hours. Desquamation is either very slight or entirely absent. In one case a few (three) lesions were noted on the abdomen twenty-four hours before the rash was fully developed. The eruption is morbilli-

form; and consists of small, pale red macules or maculopapules, from one-sixteenth to three-sixteenth inch (1.5 to 5 millimeters) in diameter. These disappear on pressure like rose spots. The lesions are usually profuse and fairly well distributed over the body, the lower part of the face, the neck and extremities. There are usually more lesions on the trunk than on the face or extremities. The trunk from the neck to the pelvis has been so covered in some instances that a small coin would touch a number of lesions. Coalescence of lesions, giving a blotchy appearance somewhat suggestive of urticaria, was noted in a few cases. The lesions are more macular than papular and a pale areola about the macule has frequently been noted.

The Blood.—As shown in the table, there is ordinarily a leukopenia present which may be quite striking, falling as low as 3200 cells in two cases. In all but one of eight cases studied (CASE VII) there was also a relative lymphocytosis present, the lymphocytes amounting to from 80 to 90 per cent. This has caused in several cases the suspicion of a typhoid infection; but in three cases a Widal test was negative. With the exception of a relative increase in lymphocytes and relative decrease in the polynuclears, the other cells apparently stand in normal relation to one another. In one case a blood culture remained sterile. Unfortunately only one blood culture was taken, and this on the morning that the rash appeared and the temperature had fallen to normal.

Differential Diagnosis.—This condition can be distinguished from measles by the absence of all catarrhal symptoms and Koplik spots, the character and development of the eruption, and the non-communicability. It is distinguished from scarlet fever by the absence of angina, the onset and course of the fever, the blood picture, the type and course of the eruption and absence of desquamation.

The onset, high fever, late appearance and type of the rash, the absence of post-cervical adenopathy, distinguish the condition from rubella. In rubella the rash appears at the height of the fever and the temperature falls gradually. The blood picture is distinctly different.

The condition is easily differentiated from a drug rash.

Treatment.—Liquid diet should be ordered, until the fever is normal. A laxative should be ordered to cleanse the gastrointestinal tract.

VIII.

MEASLES (MORBILLI, RUBEOLA).

MEASLES is an acute eruptive disease associated with fever. It is caused by the invasion of a specific micro-organism the character of which has not yet been definitely determined. The eruption is macular or papular and arranged in irregular, crescentic groups. It appears first on the face.

Bacteriology.—Anderson and Goldberger have settled the question of the period of infectivity of the blood in measles. By inoculating monkeys with human blood from patients suffering with measles they find that the period of infection is greatest just before, and for about twenty-four hours after, the first appearance of the exanthem. At the end of about twenty-four hours from the first appearance of the eruption, the infectivity of the blood appeared greatly reduced and became progressively less thereafter. The virus of measles belongs to the ultra-microscopic group. Aronson and Sommerfeld found that the toxicity of the urine was increased in measles. Thus, if 2 cubic centimeters of urine from a case of measles were injected intravenously into a guinea-pig, the pig died immediately with the symptoms of anaphylactic shock, or else became extremely ill. While this same toxicity can be found in children suffering with the fourth disease, and also with the serum disease, no such toxicity was found in urine from cases of scarlet fever, pertussis, typhoid, and tuberculosis.

Aronson and Sommerfeld concluded from their experiments that the urine test will be a strong differential point in diagnosis between scarlet fever and measles. It would be important to note that the virus has not been demonstrated in the mealy desquamation.

Etiology.—Measles is a contagious and to a less extent an infectious disease. It is usually communicated direct from person to person. Intermediate contagion is comparatively rare. Contagion is possible three or four days before the rash appears on the skin, and continues until desquamation has ceased. Children differ as to their susceptibility, some contracting the dis-

ease by very short exposure, while others require a longer and more intimate contact.

The disease can be more readily conveyed in poorly ventilated or crowded apartments, schools, and kindergartens; where many children are intimately associated.

Blake and Trask¹ have studied the natural path of infection for measles. Their studies were conducted on monkeys.

The group of symptoms induced have been constant and definite; and they have been successfully carried through six passages by intratracheal injection of saline emulsions of the skin and buccal membranes of monkeys killed from two to six days after the onset of the reaction. Intravenous injection of citrated whole blood from "passage" animals has likewise induced the characteristic group of symptoms. The cultures of the blood have consistently shown no growth.

Not only does the symptomatology of the reaction induced by inoculation with material containing the virus of measles closely parallel that of human measles, but the lesions are reported by Blake and Trask² to be essentially identical in the two species. These findings, considered together with the reported successful transmission of the reaction from monkey to monkey and the elimination of ordinary bacteria as a possible source of error in the interpretation of the results, appear to support the expressed belief of Blake and Trask that the reaction is caused by the inciting organism of measles.

Period of Incubation.—The period of incubation ranges between nine and fourteen days, the average being eleven days. Some authors³ give eighteen to twenty-one days as the period of incubation when measles occurs a second time.

Quarantine.—A case of measles may be permitted to return to school five days after the appearance of the rash. Continued quarantine beyond this period is unnecessary unless a suppurating complication such as otitis, vaginitis, empyema, or retropharyngeal abscess exists.

¹ BLAKE, F. G., and TRASK, J. D. JR.: Studies on Measles, I, Susceptibility of Monkeys to the Virus of Measles. *J. Exper. Med.*, 33: 385, March, 1921.

² BLAKE, F. G., and TRASK, J. D. JR.: Studies on Measles, II, Symptomatology and Pathology in Monkeys Experimentally Infected, *J. Exper. Med.*, 33: 413, March, 1921.

³ GRAHAM: Article on "Measles," *Morrow's "System of Dermatology,"* vol. iii.

Institutions may prolong the period of quarantine although five days of isolation, from the beginning of the disease, is sufficient for uncomplicated cases.

Pathology.—In a study of the early mucous lesions in the mouth Slawyk found that the epithelial cells were thickened and in some instances had undergone fatty degeneration. No specific micro-organism has been found in the lesions. Frequently there is a tendency to the formation of ulcers, which extends to the deeper parts. Unna called attention to the thrombosis of superficial vessels of the skin in a severe type of measles resembling smallpox. When gangrene existed, streptococci were always present. Corneil and Babes report a special form of pneumonia beginning as an interstitial pneumonia and later giving rise to a fibrinous effusion into the alveoli. It involves the lymphatic system, the interlobular and interalveolar tissue.

The toxic effect of the measles virus resembles pathological changes noted in diphtheria. They can be found in the central nervous system. No doubt, the toxin generated by a specific organism similar to that of the Löffler bacillus found in diphtheria causes the degenerative changes.

Blood.—During an acute attack of measles the blood shows a marked leucocytosis but there is no characteristic picture present in every case which would be pathognomonic of the disease. The leucocyte count early in the disease is rarely above 12,000 to 14,000 and the polynuclear neutrophiles about 50 per cent. rarely higher. If fever continues after the first week indicating a complication such as bronchopneumonia, otitis or arthritis then the leucocytosis usually increases, likewise the polynuclear percentage. Increasing leucocytosis is a good prognostic sign, decreasing leucocytosis shows poor resistance and is usually a bad symptom.

Immunity.—Immunity is usually conveyed by one attack of measles. Recurring attacks of measles are possible and I have seen measles in the same child three different times.

Age Incidence.—While measles is rarely seen in infants under one year, it does occur in infancy. It is more often met with in the rachitic and underfed infant, more so in the artificially fed infant than in the maternal fed infant. There seems to be more resistance in the nursing infant to the acute infectious diseases than in the artificially fed infant. I have seen many nursing infants in the measles wards of the Riverside and the Willard

PLATE XLVIII



MEASLES ENANTHEM.

Earliest symptoms of measles. Can be seen several days before eruption on body appears. Characteristic bluish-white speck on a rose-colored background. Minute white dots separated from one another, best seen on inside of cheek. They are very dense near the teeth; more discrete away from the teeth. Strong sunlight or reflected light will aid in locating them.

Parker hospitals who were exposed and did not contract the disease. The opinion that breast-fed infants do not become infected is wrong. I have met with nursing infants suffering with measles but I have seen many more who escaped the infection during the nursing period.

Early Symptoms of Measles.—The absence of the thick epidermic covering which masks the first pathological manifestations in the skin (exanthem) is more readily seen on the delicate mucous surfaces (enanthem).

The enanthem in measles has long been known. It has been studied by Willan, in 1806; by Heim, in 1812; in Dunglison's "Cyclopædia of Practical Medicine," in 1854; by Trousseau, in 1866. Niemeyer's "Practice of Medicine," 1876, vol. ii, p. 528, mentions Rehn, who studied an eruption in the cheek, gums, lips, and fauces. Rilliet and Barthez, 1854, and Monti, in 1873, devote considerable attention to the prodromal enanthem of measles.

The enanthem is found in 90 per cent. of all cases examined and may therefore be considered a characteristic symptom of measles.

The enanthem can be seen as punctate bluish-white specks on a rose colored background. They appear on the inside of the cheek. They are very numerous on the gums near the double teeth, less concentrated on the inner cheek. To detect these spots, strong sunlight or reflected light is required.

Symptoms and Diagnosis.—*Prodromal Stage or Period of Invasion:* The first symptoms are those of an ordinary coryza, sneezing, dry cough, and watering of the eyes (lacrymation), with photophobia. There is moderate fever, the temperature being from 101° to 102° F., rarely higher during the first day. There is sometimes vomiting. A croupy, barking cough sometimes precedes the eruption. Likewise an earache will sometimes exist.

This condition lasts about three days and is followed by the characteristic eruption. This eruption is first seen on the face or neck on the morning of the fourth day. Very young infants show extreme irritability and restlessness. The tongue is covered with a white fur. The papillæ are red and swollen. They are not as conspicuous as in scarlet fever. There is intense dryness and thirst, with marked anorexia, and usually constipation.

The temperature shows great variability. Wunderlich, Thomas and von Jurgensen, who have studied the temperature

exhaustively, state that it cannot be considered characteristic, owing to its frequent variations. The temperature, after having reached 102° or even 104° F., will on the second day of the disease drop to nearly normal. There is usually a morning remission to the temperature. The temperature in a characteristic case is sometimes deceptive, so that after three or four days of illness there may be a sudden activity of all symptoms with a rise of temperature. The temperature frequently reaches 105° F.

MEASLES.
TABLE NO. 49.—WILLARD PARKER HOSPITAL.

| Year. | Admitted. | Discharged. | Died. | Mortality Including 48-Hour Cases. |
|-------|-----------|-------------|-------|------------------------------------|
| 1915 | 1116 | 925 | 160 | 14.7 |
| 1916 | 676 | 547 | 139 | 20.2 |
| 1917 | 1164 | 949 | 176 | 15.6 |
| 1918 | 792 | 692 | 127 | 15.5 |
| 1919 | 494 | 412 | 50 | 14.7 |
| 1920 | 907 | 796 | 134 | 14.4 |

Pneumonia Complications.
1919 Percentage. 1920 Percentage.
18.1 19.4

Koplik described these symptoms¹ and to him belongs the credit of having popularized the enanthem. It is generally known as Koplik's sign. The spots are best seen on the inside of the cheeks opposite the molar teeth, although I have seen them very clearly defined on the mucous membrane of the upper lip corresponding to the incisors.

Differential Value of this Sign.—This enanthem is of great value in differentiating measles from other exanthemata, notably, however, from antitoxin rashes, drug eruptions, and eruptions associated with toxemia from gastric fevers.

The Rash.—The eruption usually appears on the fourth day of the disease. Sometimes it appears as early as the third and sometimes as late as the fifth day. The first spots appear on the forehead or the temples, behind the ears, and on the sides of the neck. Later, spots appear about the eyes, mouth, and chin. When the rash is at its height then a *crescentic* character, first

¹ Archives of Pediatrics, December, 1896; Medical Record, 1898.

PLATE XLIX



Measles. A dark red sometimes purplish colored rash, oval or crescentic in character. Macular or papular in appearance, slightly elevated and usually appear very strong on the face and neck.

described by Willan, will be noticed. The constitutional disturbances increase in severity. The cough is more pronounced and there is a decided interference with the respiration. Nose-bleed is quite frequent. Constipation is usually followed by very loose bowels.

The rash is of a dark-red, sometimes a purplish color, of a round, oval or irregular shape. The skin between the rash remains intact, although the face has a puffy, edematous appearance. The eruption extends over the trunk and extremities, including the palms and soles, the arms and legs, the forearms and legs being the last to become affected.

When the rash reaches its height the constitutional symptoms subside. It is not infrequent to see a *normal temperature two days after the rash has completely covered the body*. In some instances there is a crisis, although the usual rule is for the temperature to fall gradually by lysis. A subnormal temperature frequently follows and accompanies the period of convalescence and until the patient is normal.

Tardy Eruption.—The eruption is sometimes slow in developing. This renders the diagnosis difficult. To hasten the eruption a hot bath should be given followed by warm blanketing until thorough perspiration ensues. While wrapped in these blankets warm drinks such as lemonade, tea, milk and broths should be given.

Spiritus mindererus freshly prepared should be given in 1 teaspoonful doses every two hours to a child from 5 to 10 years of age. Younger children should receive one-half the dose. This will aid in hastening the appearance of a tardy rash.

The catarrhal symptoms continue to increase in severity with the development of the rash.

There are moist râles heard on auscultation. The sputum as well as the nasal discharge becomes sero-purulent. A bronchitis or a pneumonia should be suspected, if the respiration is exaggerated. The pulse-respiration ratio will be found of great value in diagnosing some latent pneumonia. The urine will show the excess of urates, and sometimes transitory albuminuria or hyaline casts may be found. The diazo reaction is sometimes noted, but it does not teach us anything of value in either the diagnosis or prognosis. This stage of the disease rarely lasts more than from four to six days.

Stage of Desquamation, or Convalescent Period.—The eruption on the skin of the face, neck, and upper part of the chest fades and there is a slight, branny desquamation. This is less marked than in scarlet fever, and is so fine on the trunk and extremities that it may be unobserved. *It is best seen on the sides of the nose, temples and chin. Large, flaky scales are rarely met with in measles.* The desquamation is of a fine, mealy character. After the eruption disappears, a certain amount of pigment remains for a week or two where the rash existed.

Anaphylaxis.—Morbilliform rashes frequently follow the ingestion of certain albuminous foods, so that some children will be covered with an eruption resembling measles when partaking of eggs or meat. Other children will have a severe eruption after an injection of horse-serum. This subject has been described in detail in the chapter on Diphtheria.

The characteristic feature of an anaphylactic reaction (morbilliform type) is the absence of the catarrhal symptoms. There is no conjunctivitis nor cough, which latter always accompanies true measles.

The temperature rises the day preceding the eruption, and returns to normal on the appearance of the exanthem.

Atypical or Anomalous Conditions.—Certain symptoms of normal measles vary in different epidemics, although the majority of cases present distinct clinical features. Predisposing factors, such as rickets and scurvy, possibly tuberculosis, will frequently alter the type of the disease or modify the symptoms. Edgar reports an epidemic of 423 cases in which 123 adhered to the regular type.

Abortive Type.—We occasionally see a child with catarrhal symptoms and an eruption lasting but one or two days, after which the child is as well as ever. Such cases will frequently baffle the physician because of the irregular course. These cases belong to the abortive type.

Typhus Fever.—Typhus fever frequently resembles measles. There is an absence of the catarrhal symptoms common to measles. The eruption is more marked on the body, less marked on the face. In typhus there are severe nervous and cerebral manifestations which rarely exist in measles.

In measles the eruption is macular or papular and arranged in irregular, crescentic groups, and begins on the face.

In typhus the eruption is rarely seen on the face and is petechial in character.

Mild Forms.—Measles may be present without catarrhal symptoms. In such cases fever may be slight or absent. In other cases the catarrhal symptoms are severe, *while the cutaneous exanthem is almost wholly absent* (morbilli sine morbillis). Such cases might readily escape notice unless they partake of a series during an epidemic in which both the mild and the severe type are found.

Relapsing Form, or Second Attack.—A relapse is said to occur in rare instances after the exanthem has disappeared. When the second rash appears there is a return of fever and also the other constitutional symptoms. Recurring measles is often a very serious matter, owing to the already weakened state resulting from the first invasion.

Corlett doubts the so-called relapses and believes that they are due to a direct re intoxication by the specific virus.

Severe or Malignant Forms.—Malignant measles is that form in which there is a very high fever, rapid pulse, labored breathing, and great prostration. The fatal issue most frequently occurs on the second day of the exanthem. We frequently meet with a typhoidal or a toxic form in which the symptoms are of a most malignant character. The mouth becomes parched and the tongue brown and dry, resembling a typical typhoidal condition.

The bowels are loose and the quantity of urine diminished. Convulsions resulting from the general toxemia are very common. It is usually fatal and rarely ends in recovery. Where there is severe respiratory disturbance, with difficult breathing, it is called the *suffocative form*. In this form we have principally cough and expectoration with severe dyspnea.

The patient is cyanotic. Mucous râles are heard early in the disease, and not infrequently end in a bronchopneumonia.

Hemorrhagic forms, known as the black measles, are frequently described. The mild form of hemorrhagic measles has been described by various authors. Edgar reports 200 cases out of 423, or 47 per cent. of the hemorrhagic form. Holt found it in 5 per cent. of his cases. The cutaneous exanthem assumes a dark bluish or purplish tint, which gradually deepens as the process continues, to a bluish-black color. Frequently the whole body shows a tendency to bleed. Thus the mucous surfaces are implicated, giving rise to epistaxis, bleeding from the gums,

TABLE NO. 50.—SHOWING 503 CASES OF MEASLES AND COMPLICATIONS, TREATED IN THE RIVERSIDE HOSPITAL, NEW YORK CITY.

| | No. of Cases. | | Uncomplicated Measles. | | Measles and Diphtheria. | | Measles and Pneumonia. | | Measles, Scarlet Fever and Diphtheria. | | Measles and Scarlet Fever. | |
|--------------|---------------|--------|------------------------|--------|-------------------------|--------|------------------------|--------|--|--------|----------------------------|--------|
| | Cases | Deaths | Cases | Deaths | Cases | Deaths | Cases | Deaths | Cases | Deaths | Cases | Deaths |
| Jan. | 34 | 4 | 31 | 1 | 2 | 2 | 1 | 1 | | | | |
| Feb. | 70 | 8 | 62 | 1 | 7 | 6 | 1 | 1 | | | | |
| Mar. | 133 | 14 | 111 | 2 | 9 | 6 | 4 | 4 | 2 | 1 | 7 | 1 |
| Apr. | 103 | 15 | 84 | 0 | 8 | 8 | 10 | 7 | 1 | 0 | | |
| May | 106 | 16 | 77 | 2 | 13 | 4 | 13 | 8 | 1 | 1 | 2 | 1 |
| June | 37 | 8 | 23 | 0 | 7 | 3 | 7 | 5 | | | | |
| July | 20 | 5 | 12 | 0 | 3 | 1 | 5 | 4 | | | | |
| Total Cases | 503 | | 400 | | 49 | | 41 | | 4 | | 9 | |
| Total Deaths | | 70 | | 6 | | 30 | | 30 | | 2 | | 2 |

dysentery stools and hemorrhages from the genitourinary tract. Where a tendency to hemorrhage exists, as in hemophilic subjects (bleeders), they are especially predisposed to the hemorrhagic form.

Complications.—*Pulmonary*: There seems to be a predisposition to pulmonary disease, commencing with a bronchial catarrh, especially in those children with feeble resisting power. The inflammatory condition extends into the smaller ramifications of the bronchial tubes, causing capillary bronchitis. When this occurs it should be viewed with alarm. The child shows dyspnea and adynamic symptoms, owing to difficult oxygenation.

Bronchopneumonia.—This is the most frequent and the most fatal complication of measles. Houl found it in one-fifth of all his cases. In the Nursery and Child's Hospital of New York, Holt observed it in 40 per cent. of all cases. This infection can

invariably be traced to the presence of various organisms of which the pneumococcus of Friedländer, and the micrococcus of Fränkel play a conspicuous rôle.

There is marked retraction of the chest in addition to the usual signs of pneumonia. The physical examination shows widely disseminated subcrepitant râles which soon give way to

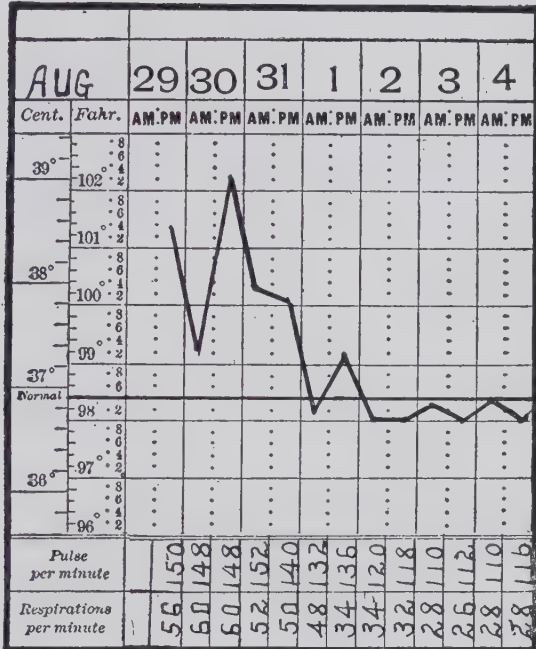


Fig. 175.—Temperature chart from a case of measles complicated by bronchopneumonia. Seen during my service at the Riverside Hospital, New York City.

definite resonance, bronchial breathing, and fine crepitations. In young children its onset is acute, with rapid pulmonary congestion, and it usually terminates fatally within two or three days. When the condition extends over a more subacute course, it may lead to caseous pneumonia or pulmonary tuberculosis.

Case I.—Kate A., aged 21 months. Child was admitted to the Riverside Hospital, August 25, in fairly good condition, with temperature 104° F., pulse 136, respiration 36. Sick since August 22d. Child had a moderately severe cough on admission. On August 26th cough increased in severity, breathing short, rapid and labored.

Physical examination showed only a few coarse râles at upper part of chest posteriorly, with slight dullness, but no bronchial breathing.

Well-marked dullness over the right base posteriorly, with bronchial voice and breathing. Left base behind gave slight dullness with many coarse râles. No bronchial breathing.

On August 28th, pleuritic friction sounds over right base posteriorly.

On August 31st, percussion gave marked dullness, almost flatness over this area, extending slightly above the inferior angle of right scapula. Over this area, marked bronchial voice and breathing.

On September 1st, bloody serum obtained upon aspiration.

On September 3d, serum obtained by aspiration, bloody with slight turbidity. General condition continued the same up to September 9th. On this

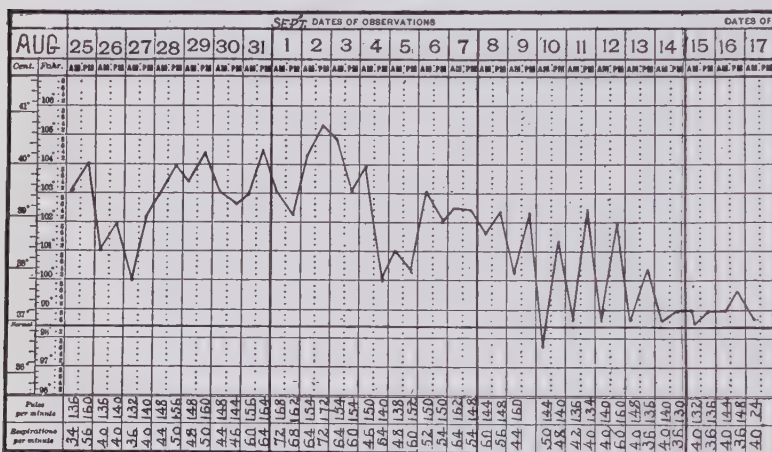


Fig. 176.—Temperature chart from a case of measles complicated by bronchopneumonia. Seen during my service at the Riverside Hospital, New York City.

day a drop in the temperature from 102° to 97.6° F. occurred. Child appeared brighter, slept well and had a good appetite.

During the last two days, fluctuations in temperature have occurred, ranging from 98° to 101° F. (evening rise).

This fluctuation of temperature continued up to September 14th. On this date there was an evening rise to 99° F. only, and since then, the highest rise has been 99.3° F. The pulse has improved much in quality. Respirations have gradually diminished in frequency. The child was aspirated on the 13th, but no pus or serum was obtained. Dullness was diminished over right base posteriorly and bronchial breathing was present only over a small area at base of right lung.

Case II.—L. Z., age 8 months. Admitted to the Riverside Hospital on August 29th, having been ill since the 21st. Upon admission showed characteristic symptoms of bronchopneumonia with temperature 101.4° F., pulse,

150; respiration, 56. Upon examination, dullness was present over right base behind, with bronchial voice and breathing. Many coarse râles were heard over both lungs behind as well as in front. There was a pleuritic friction sound over the consolidated area. No signs of effusion. Child improved rapidly, and upon September 3d, the bronchial breathing had disappeared and only signs were coarse râles over both bases behind. Recovery.

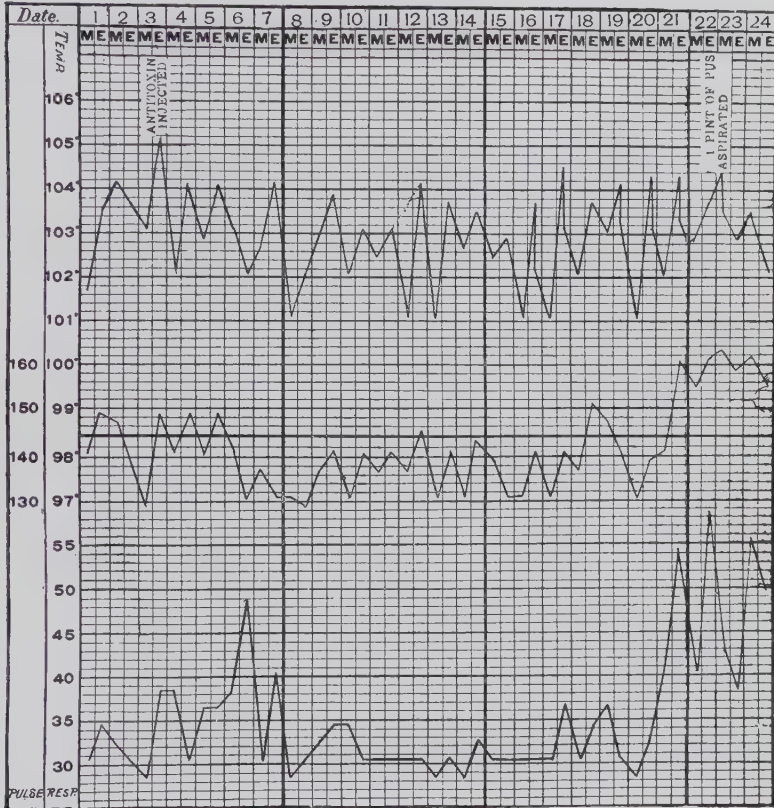


Fig. 177.—A case of malignant measles, complicated by diphtheria and ending with empyema. Male child, 3 years old. Septic from beginning. Fatal termination. Seen in my service at Riverside Hospital, New York City.

Empyema.—Empyema is occasionally met with during the course of measles. As there seems to be a decided tendency to suppurative formations, it is well to inspect the thorax and be sure that we can exclude empyema. This should be borne in mind if cough exists associated with fever. I have seen empyema complicating measles in about 2 per cent. of my cases. When the

exploratory puncture shows pus the treatment is the same as that given in the chapter on Empyema.

TABLE NO. 51.—MEASLES STATISTICS SHOWING
EAR COMPLICATIONS, RIVERSIDE HOSPITAL.

| | Number of Cases. | Measles and Otitis. |
|----------|---------------------|------------------------|
| January | 31 | 6 |
| February | 74 | 11 |
| March | 127 | 10 |
| April | 101 | 14 |
| Total | 333 | 41 |

*Otitis.*¹—One of the most frequent and painful complications is otitis. Infants or older children will cry continuously, roll their head or pull at the ear. If fever is present during the course of measles then the ear should be examined. Mastoid involvement can frequently be prevented if an early diagnosis of otitis is made. If a bulging drum is present a paracentesis should be done. The earlier the incision the better the result. Often the temperature will drop several degrees after an incision. The after-treatment consists in douching the ear with one pint of water at a temperature of 105° F., in which a teaspoonful of borax is dissolved. If there is profuse discharge then hourly irrigations should be given, otherwise every two or three hours is sufficient. It is a good plan not to disturb a child at night more than once to syringe the ear, and then only if the discharge is profuse. In acute otitis with pain and redness but without bulging of the drum, the instillation of several drops of the following mixture: phenol, 10 drops; glycerin 1 ounce, will afford relief if dropped into the ear.

S. Weiss, of Vienna, advises the prophylactic application of 1 per cent. yellow precipitate ointment on a sterile swab to the nostrils and also in both ears.

¹ See page 975.

Tobeitz found that 86 per cent. of fatal cases of measles had ear complications.

Bezold found 17 ear complications or 95 per cent. of 18 fatal cases of measles studied.

The Larynx.—One of the most frequent and fatal complications met with in children is laryngitis. This may be:—

- (a) Spasmodic.
- (b) Phlegmonous.
- (c) Membranous.

The last-named complication is one most frequently met with, especially in institutions. It is most common during the eruptive stage as early as the third or fourth day. The symptoms are the same as those met with in laryngeal diphtheria accompanied by stenosis of the larynx.

The Klebs-Löffler bacillus is sometimes found on bacteriological examination of the pseudomembrane. It can be found in 6 to 10 per cent. of all cases of membranous laryngitis.

The Eyes.—Severe inflammatory and destructive changes are met with in measles. Abscesses of the conjunctiva or keratitis, resulting in ulceration of the cornea, are sometimes seen. In other cases it may extend to the antrum or, if the mastoid cells are involved, it can result in meningitis, cerebral abscess, or pyemia. In very young children the petromastoid suture, which at this time is still patent, allows free access of pus into the cranial cavity from the middle ear. Not infrequently this condition leads to actual deafness.

Differential Diagnosis.—Abnormal types of measles are very confusing. The mouth and the cheeks with the enanthem is usually present several days before the eruption appears and several days after the eruption. The temperature is characteristic in measles. It rises suddenly and after attaining its full height, 103°, 104° or 105° F., it drops like a crisis to normal between the second and fourth day after the appearance of the rash. The drop in scarlet fever is gradual by lysis. The same is true in influenza.

Drug eruptions resembling measles frequently follow the use of quinine and antipyrine. This is also true of chloral, cubebs and copaiba. Insect, flea and bug bites will sometimes cause an eruption resembling measles.

The characteristic symptoms of measles, such as coryza, suffused eyes, the enanthem, and especially fever, are absent in other conditions.

A morbilliform rash frequently occurs after the injection of diphtheria antitoxin. It has occurred following the injection of antistreptococcus serum.

Prognosis.—Great care should be taken in expressing an opinion as to the outcome of a case of measles. The laity regards measles as a very mild affection, whereas the mortality is between 5 and 40 per cent. Uncomplicated measles is a mild affection but if complicated with bronchitis or a bronchopneumonia it means a long illness. It is well to remember that tuberculosis frequently follows bronchopneumonia in measles. Laryngeal croup is always dreaded as a complication of measles. Unless there is good resistance more than 50 per cent. die. The prognosis depends on guarding the patient against unnecessary exposure and attending to all functional disturbances.

Treatment.—Give the child excellent hygiene—fresh air, temperature of room to be no less than 70° F. no higher than 74° F. The older method of keeping the room very hot, blanketing and bundling the child creates excessive perspiration and renders the child very susceptible to draughts. Modern methods at the Willard Parker Hospital in New York and also at the various children's hospitals visited by me in Europe, admit plenty of fresh air and light. A glaring light is irritating, especially if a photophobic condition exists. The bed should be so placed, especially during the first week, that the light strikes the back of the patient.

We invite complications, rather than prevent them, by overheating the skin. The child may be sponged daily with tepid or warm water and the linen should be changed daily. Overheated rooms cause trouble and invite respiratory affections, likewise ear infections. Isolate the patient. We must not forget that in all febrile conditions the digestive function is impaired. The diet must be so regulated that there is proper assimilation. If subnormal conditions prevail, we must order a smaller quantity of food and allow a longer interval between feedings.

A baby receiving pure milk should receive one-half milk and one-half water, and if it has been fed every three hours when in good health, then it is wise to try to feed every four or five hours during the febrile stage of measles. An important point to

remember is that liquids are an important part of the treatment. Soups, acidulated waters, and carbonated waters are grateful and indicated. Orangeade and lemonade are grateful, especially to relieve thirst. If the child is older and has been fed on solid food when in health, then all solids should be discontinued and liquid food substituted.¹ Water should be given in large quantities.

The urine must be frequently examined for a possible nephritis, and the case treated accordingly.

Convulsions frequently usher in the disease and should be very carefully attended by rest, sinapisms and enemata of chloral. Epistaxis is usually an early symptom, If persistent it should be treated by plugging the nostrils with gauze saturated with thromboplastine. The congestion during an attack of measles has frequently excited an otherwise quiet polypus to activity and caused alarming hemorrhages.

For the relief of cough the following may be given:—

| | | |
|--|----------|------|
| R Ammon. bromid. | 1 dram | 3\|0 |
| Syr. liquorit. | 1 ounce | 25\|0 |
| Decoct. althæ | 2 ounces | 50\|0 |
| M. Teaspoonful every hour, for a child 1 year old, until relieved. | | |

For a child 2 years old, at night:—

| | |
|--|---------------------------------------|
| R Codeine ¹ | $\frac{1}{40}$ to $\frac{1}{5}$ grain |
| Sacch. alb. | $\frac{1}{2}$ dram |
| M. Divide in chart No. ii. | |
| Sig.: One powder at bedtime, repeat in two hours if necessary. | |

Do not give solid food; liquid diet only, soups, broths, milk, buttermilk if tolerated, etc.

Do not give useless drugs. Treat symptoms, such as hyperpyrexia, constipation, suppression of urine, and assist the emunctories. During the convalescing stage, restoratives such as cod-liver oil, pure or in emulsion, iron, or the malt preparations are indicated. The food should consist of cereals, vegetables, eggs, butter, cream, oranges and stewed fruits. Meat may be given sparingly.

When cough remains and symptoms point to the beginning of tuberculosis, we must not lose sight of the fact that more can be accomplished by climatic treatment—out of doors, in the

¹ Such small doses of codeine do not conflict with the Harrison Law, nor will they create a drug habit.

TABLE No. 52.—ACUTE SPECIFIC INFECTIOUS DISEASES.

| Disease. | Symptoms Begin After Exposure. | Characteristic Symptoms. | Other Symptoms. | Desquamation. | Complications and Sequelæ. | Duration of Disease. | Isolation. |
|-----------------|---------------------------------|--|--|----------------------------|--|------------------------|--|
| Influenza. | 1 to 3 days. | Fever, coryza, bronchial, gastroenteric symptoms, at times cerebral symptoms, such as convulsions—or stupor—with muscular twitching. | Crying as if in pain. | ..... | Lungs. Kidneys. Intestines. Nervous system. | About 1 week. | 2 weeks. |
| Pneumonia. | Indefinite. Usually a few days. | Disturbed ratio of pulse and respiration. Normal ratio, 1: 4. In this condition 1: 3 and frequently 1: 2. | Cough. Bronchial breathing. Dullness on percussion. No expectoration. | ..... | Kidneys. Meningitis. Empyema. Tuberculosis. | 5 to 8 days or longer. | About 2 weeks. |
| Measles. | 8 to 14 days. | Enanthem on Buccal Mucous-membrane. Dusky or purplish red, slightly elevated spots, crescent-grouped, seen on face first. | Begins with cold in head, running eyes, cough, eruption on fourth day. High fever. | Furfuraceous in character. | Eye. Lung (empyema). Tuberculosis. Ear (mastoid). Heart. | 3 to 7 days. | 2 to 3 weeks. |
| German Measles. | 1 to 3 weeks. | Pale rose red spots or blush, not grouped, fades rapidly. | Slight fever, eruption on first day. | ..... | Rare. | About 1 week. | 2 weeks. |
| Scarlet Fever. | 1 to 8 days. | Intense bright red blush over body beginning on chest. | Sore throat, vomiting, high fever, eruption first or second day. | Small scales. | Kidney. Ear. Heart. | Little over 4 weeks. | 6 weeks, continuation during desquamation. |
| Chicken Pox. | 1 to 2 weeks. | Pra-sized vesicles filled with watery fluid. | Slight fever, eruption first day. | Small crusts. | Rare. | About 1 week. | 2 to 3 weeks. |
| Smallpox. | 12 days. | Papular stage is longer and the eruption ends with formation of pustules. Eruption is deep seated and hard, usually umbilicated. Frequently confluent vesicles, which do not collapse when pricked with a pin. | Convulsions frequently in children, fever, loss of appetite. Initial stage masked. Eruption largely on face, hands and feet. | Large crusts. | Larynx. Lungs. | 3 to 4 weeks. | 6 weeks. |

| | | | | | | | |
|------------------|-----------------------|--|--|-------------------------|---|-------------------------------------|-----------------------------|
| Diphtheria. | 2 to 10 days. | White or grayish-white membrane on tonsils or pharynx. | Sore throat, weakness, fever. Pain on swallowing. Older children complain of headache. | ..... | Lungs. Heart. Kidneys. Ears. Brain. Paralysis. | 1 to 2 weeks. | 3 to 4 weeks. |
| Whooping Cough. | 2 to 7 days. | A long paroxysm of coughing followed by the crowing whoop at the end, frequently ending in vomiting. | Cough during first week of infection resembles bronchitis. Characteristic cough, often not seen until second week. Vomiting. | ..... | Heart. Bowel. Hemorrhages. | 6 to 8 weeks. | As long as the whoop lasts. |
| Mumps. | 1 to 3 weeks. | Glandular swelling below one or both ears, under the jaw. | Pain on chewing, inability to swallow. | ..... | Orchitis. Abscess. | About 1 week. | 3 to 4 weeks. |
| Typhoid Fever. | 5 to 14 days. | Rose-colored, lenticular-shaped spots appear at the beginning of the second week. Eruption lasts 6 to 10 days. Fever, step-ladder type. | Diarrhea or constipation. Sometimes convulsions. Enlarged spleen. Thirst. Prostration. Delirium. | ..... | Blood. Lungs. Heart. Peritoneum. | 21 days. | ..... |
| Acute Arthritis. | 3 to 5 days. | Cachectic appearance. Swelling of the joint. Fever. | Pain. | ..... | Heart. Ankylosis. | 1 to 3 weeks. | ..... |
| Malaria. | 1 to 14 days. | Intermittent fever. Cyanosis affecting nails. | Enlarged spleen. Convulsions. Prostration. Drowsiness. Vomiting. | ..... | ..... | 1 to 2 weeks. In rare cases months. | ..... |
| Syphilis. | Not positively known. | Eruption sometimes diffuse, flush or roseolar, more frequently macular, occurring in dark red spots about the size of an infant's tooth. Occur mostly on face and extremities. Painful swelling at extremities of long bones. Pseudoparalysis. | Cachexia. Wasting. Coryza. Onychia. Diarrhea. | ..... | Lungs. Peritoneum. | ..... | ..... |
| Erysipelas. | 3 to 7 days. | Painful swelling of the lymphatic glands of the region involved. Intense red color of the region involved. | Prostration. Fever. Vomiting. Diarrhea. Convulsions. | Yellowish-brown Crusts. | Gangrene. Septicemia. | 2 to 16 days. | Until after desquamation. |

* Tetanus is described in Part IX, Diseases of the Brain and Nervous System.

country—than by indoor treatment. Complete change of air, to a more even climate like Southern California; Stamford, New York; Asheville, N. C.; Denver, Colo.; New Mexico, or Florida, will frequently restore the lungs to their normal condition.

Immunity from Diphtheria.—The danger of diphtheria and especially croup has been mentioned in the article on intubation. The mortality being very high, it is our duty to inquire whether a Schick test has been made to determine the immunity of the child against diphtheria. If this has not been done then 1000 units of antitoxin should be injected early in the disease, to convey immunity. As such immunity lasts about three weeks it would be well to repeat the injections unless the measles has terminated.

IX.

SCARLET FEVER (SCARLATINA).

SCARLET FEVER is an acute infectious, specific and contagious disease. This disease is usually ushered in by vomiting and sore throat, accompanied by fever. If the child is old enough it will complain of headaches.

The pulse-rate will be accelerated, and there is usually on the second day a distinct eruption visible. This disease presents several types: The mildest form, known as *scarlatina simplex* or the benign form, and the most malignant type, *scarlatina maligna*, called by the French "foudroyante."

There are a great many varieties between the two types just mentioned, so that any sharp differentiation is quite impossible.

Of the many varieties, those most frequently met with are: First, mild; second, septic, and occasionally the hemorrhagic type is seen.

Etiology.—It has been established beyond doubt that disease germs even though they might exist in desquamated cuticle die when exposed to the air. The theory of the transmission of scarlet fever by such means is wrong. That the disease is transmitted through the air has not been established. Personal contact is necessary. It has been found to be contagious at or about the period of eruption, so that contagion is conveyed several days before and usually for one week after the appearance of the rash.

Infection by Contact.—In Paris, the Pasteur Hospital has demonstrated that infection in hospitals can be minimized by avoiding contact. Grancher, in Paris, employed wire screens around the beds to impress the nurses with the necessity for guarding against infection by contact.

Scarlet Fever and Milk.—Hall, in a very interesting article, found, after an extensive review of the literature, that, while scarlet fever occurs in epidemic form in those countries where cows' milk forms a staple article of food, especially among children, it does not occur in countries where cows' milk is not used as a food, or where children are raised on mother's milk only.

This is true of Japan, where cows' milk is not used and domestic animals are scarce, and it is true in India, also, where, though cows' milk is used, the children are nursed by their mothers until they are 3 or 4 or even 6 years of age.

While this immunity from scarlet fever, together with the absence of cows' milk as an article of food, may be simply a coincidence otherwise explainable, does it not suggest the possibility of infection through the gastrointestinal tract as perhaps the chief source?

Climate.—Epidemics are more common in America in the fall and winter than in the summer months, although I have seen malignant cases both in hospital and private practice just as bad in midsummer as in midwinter. We know by clinical experience that the poison of scarlet fever is less volatile than that of measles, and is not transmitted any great distance through the atmosphere (Hall).

TABLE No. 53.—SCARLET FEVER CASES OCCURRING IN CHILDREN UNDER 18 YEARS. WILLARD PARKER HOSPITAL.

| Year. | Sex. | Grand Total. | Under 1 Year. | 1 to 2 Years. | 2 to 3 Years. | 3 to 4 Years. | 4 to 5 Years. | 5 to 6 Years. | 6 to 7 Years. | 7 to 8 Years. | 8 to 10 Years. | 10 to 12 Years. | 12 to 15 Years. | 15 to 18 Years. |
|-------|--------|--------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|----------------|-----------------|-----------------|-----------------|
| 1910 | Male | 870 | 7 | 39 | 80 | 105 | 76 | 90 | 87 | 87 | 113 | 65 | 69 | 52 |
| | Female | 914 | 11 | 40 | 82 | 93 | 81 | 109 | 92 | 80 | 126 | 84 | 78 | 38 |
| | Total | 1784 | 18 | 79 | 162 | 198 | 157 | 199 | 179 | 167 | 239 | 149 | 147 | 90 |
| 1911 | Male | 705 | 9 | 28 | 60 | 65 | 72 | 84 | 90 | 45 | 69 | 104 | 38 | 41 |
| | Female | 947 | 9 | 58 | 75 | 100 | 90 | 110 | 99 | 90 | 160 | 37 | 59 | 60 |
| | Total | 1652 | 18 | 86 | 135 | 165 | 162 | 194 | 189 | 135 | 229 | 141 | 97 | 101 |

Age.—The greater number of cases occur between the ages of 5 and 10; next in frequency, 2 to 5. Then the frequency gradually diminishes.

Stage of Incubation.—Authorities differ as to the length of time that usually elapses between the exposure to the disease and the appearance of symptoms. The usual rule is from a few days to a week, although exceptions will extend the time to several days longer.

Eichhorst and von Leube give it from four to seven days. Individual susceptibility plays an important part in scarlet fever as well, as we have seen in other diseases.

Henoch maintains that we cannot form an idea of the severity or mildness of an attack by the early symptoms.

TABLE No. 54.—STATISTICS OF CASES OF SCARLET FEVER TREATED IN THE RIVERSIDE HOSPITAL, NEW YORK CITY.

| Number of Cases. | Deaths. | Mortality Per cent. |
|------------------|---------|---------------------|
| 835 | 76 | 9.1 |
| 718 | 46 | 6.4 |

Bacteriology.—The distinct specific cause of scarlet fever is unknown, in spite of endless scientific work. A specific micro-organism described by Class is a non-capsulated diplococcus, appearing occasionally in *streptococcic form*, polymorphous in character. It is constantly found in the pharynx in scarlatinal angina.

TABLE No. 55.—SCARLET FEVER CASES TREATED AT WILLARD PARKER HOSPITAL.

| | 1910 | 1911 | 1912 |
|---|------|------|-------|
| Number of cases treated | 2302 | 1984 | 2127 |
| Total number of deaths | 247 | 211 | 179 |
| Percentage mortality | 10.7 | 10.6 | 08.41 |
| Total number dying within 24 hours | 19 | | |
| Percentage mortality | 0.8 | | |
| Total number dying within 48 hours | 36 | 38 | 27 |
| Percentage mortality | 01.5 | 01.9 | 01.2 |

Baginsky and Sommerfeld¹ found a *streptodiplococcus* in the pharynx and blood in scarlet fever which they believe to be the etiological factor in that disease. As yet scarlet fever cannot be reproduced in animals, and hence this microbe must be looked upon as the *probable causative factor*. Owing to the immense amount of research work being done, the day is not far distant when the specific factor of all infectious diseases will be discovered.

Pathology.—The gross and histological lesions found post-mortem in scarlet fever depend essentially upon two processes: First, the action of the scarlatinal toxin, associated with the changes seen in any acute febrile disease; and, secondly, they may occur as a result of a mixed infection due to entrance into the organism of the streptococcus pyogenes, the staphylococcus pyogenes aureus or albus, the pneumococcus, and, rarely, other

¹ Berlin. klin. Woch., No. 22, 1900, p. 588.

micro-organisms. So long as the specific agent concerned in the scarlatinal infection remains obscure, it must be impossible—in many instances at least—to determine, in a given case, which of these two elements is the predominant one. In cases succumbing early in their course to the intensity of the poison, before the development of secondary infections, we must assume the changes present to be due to the specific scarlatinal virus, while in those which prove fatal later, associated with grave throat lesions, streptococcic angina, etc., the possibility of an added etiological element in the lesions present after death must be admitted (Corlett).

TABLE NO. 56.—WILLARD PARKER HOSPITAL.
SCARLET FEVER.

| Year. | Admitted. | Discharged. | Died. | Mortality Including 48-Hour Cases. |
|-------|-----------|-------------|-------|------------------------------------|
| 1915 | 1062 | 1045 | 52 | 4.7 |
| 1916 | 456 | 440 | 24 | 5.1 |
| 1917 | 517 | 446 | 29 | 6.1 |
| 1918 | 626 | 606 | 62 | 9.2 |
| 1919 | 514 | 446 | 29 | 6.1 |
| 1920 | 656 | 499 | 66 | 11.6 |

Pneumonia Complications.

| | |
|------------------|------------------|
| 1919 Percentage. | 1920 Percentage. |
| 3.0 | 4.2 |

The Blood.—The diagnostic importance of inclusion bodies in scarlet fever has been confirmed by many observers. A true scarlet fever can frequently be determined by the presence or absence of the inclusion bodies. Thus, the absence of the inclusion bodies means serum exanthem and not scarlet fever.

Inclusion Bodies.—Inclusion bodies were described by Döhle in 1911. These bodies are found within the cytoplasm of the polymorphonuclear leucocytes. Since then Kretschmer, in Berlin, and Nicoll and Williams, in New York, have not only confirmed these findings, but lay stress on the diagnostic value of these bodies in scarlet fever. These bodies occur early in the disease, usually during the first five days of the infection. A simple blood smear on a clean slide and stained by Giemsa or Wright and Jenner method will bring them out. Kolmer reports 30 cases of serum sickness showing urticarial rashes ten days

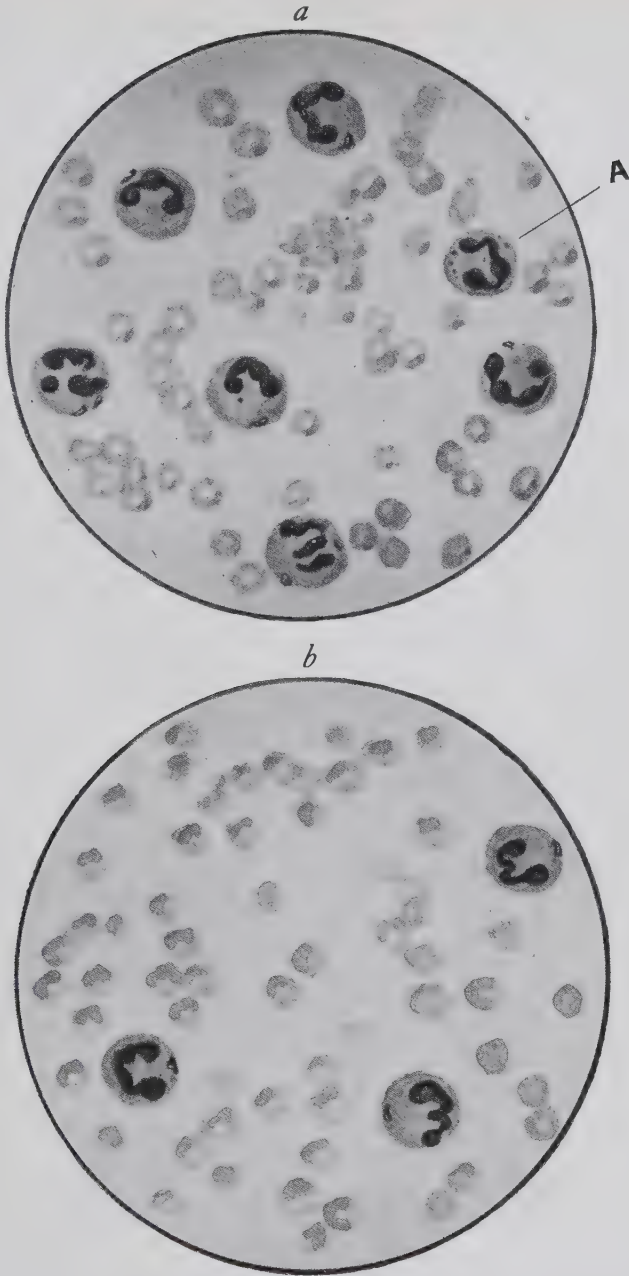


Fig. 178.—*a*, "Inclusion bodies," case of scarlet fever. *A*, Neutrophile granules. *b*, "Inclusion bodies," case of scarlet fever following extensive burns of the body. (*Kolmer.*)

after admission to the Philadelphia Hospital; not one showed the presence of inclusion bodies. Twelve cases of measles were examined and all were negative; 1 case of r  theln, negative. Of eleven cases of erysipelas examined inclusion bodies were present in 7. Inclusion bodies seem to be present not only in scarlet fever, but also in other streptococcus infections. In diphtheria inclusion bodies are frequently noted. As a rule, in the early stages of a rash following an injection of antitoxin the absence of the inclusion bodies speaks in favor of serum exanthem and against scarlet fever.

Bowie reports 167 cases with a total number of 714 counts. Of these, 77 were differential to determine the relative percentage of the three main varieties of leucocytes. The following is the summary of his conclusions:—

1. Practically all cases of scarlet fever show leucocytosis.
2. The leucocytosis begins in the incubation period, very shortly after infection; reaches its maximum at or shortly after the height or severity of the disease, and then gradually sinks to normal.
3. In simple, uncomplicated cases the maximum is reached during the first week, and the normal generally some time during the first three weeks.
4. The more severe the case the higher is the leucocytosis, and the longer it lasts; the milder the case the slighter the leucocytosis, and the shorter time it lasts.
5. A favorable case of any variety of the disease has always a higher leucocytosis than an unfavorable one of the same variety.
6. The temperature has no effect on the leucocytosis.
7. The polymorphonuclear leucocytes are increased relatively and absolutely at first, and then fall to the normal, the lymphocytes acting inversely to this. This cycle of events occurs in simple cases within three weeks.
8. Eosinophiles are diminished at the onset of the fever. They increase rapidly in simple favorable cases till the height of the disease is past, then diminish, and finally reach the normal some time after the sum total leucocytosis has disappeared—in short, when the poison has all been eliminated.
9. The more severe the case the longer are the eosinophiles subnormal before they rise again. In fatal cases they never rise, but sink rapidly toward zero.

PLATE I.



Strawberry tongue in scarlet fever. Painted from a case in the Riverside Hospital. The body rash is shown in Plate LI.



Beefy tongue in scarlet fever. The tongue has a glazed appearance. The papillæ are enlarged. This type is usually seen when desquamation begins, after the rash has faded. Painted at the bedside from a case in the Riverside Hospital.

10. The leucocytes, in complications, go through a cycle of events similar in all respects to that of the primary fever as regards both sum total and differential leucocytosis, and the same laws govern the behavior of the leucocytes in both cases.

In regard to the diagnosis of scarlet fever, the simple counting of the leucocytes gives little aid. A differential count, however, may be of aid, for scarlet fever is one of the few acute infectious diseases where one finds an increase in the eosinophiles early in the disease and the persistence of that increase for some time.

With regard to prognosis, the examination of the leucocytes seems likely to be of some practical value. In scarlatina simplex, if the case be severe, and the leucocytosis be high and rising, one may predict a favorable course; and conversely, if it be low and stationary, one may expect a tedious case. Regarding the differential count, if the eosinophiles show a relative increase, the augury is good; if they are normal or subnormal after the first day or two, then the case will in all probability be a severe one. Furthermore, as long as a relative increase of eosinophiles is present one cannot be sure that some complication will not ensue; whereas, if the eosinophiles have come down to normal in the usual way, one may be free from anxiety in this respect.

Symptoms.—The onset is usually very sudden. In young children the attack may be preceded by a convulsion. Vomiting is an early symptom.

Tongue.—The tongue does not show the characteristic appearance during the first week of scarlet fever. We must not rely on the tongue as a diagnostic aid until after the first week, or during the second week of the disease.

The tongue has a whitish fur and the papillæ will be found elevated and very red. It has the so-called "strawberry" appearance (see Plate L). Sometimes a severe diarrhea is the first symptom. The pulse is full and rapid, from 120 to 140 beats per minute. The temperature on the first or second day is about 102° F., rarely higher.

Throat and Glands.—The pharynx, tonsils and uvula are intensely congested and the hard palate shows minute dotted areas of congestion. Grayish-white or yellowish patches of pseudo-membrane can be seen, and there is a fetor to the breath. At times the throat is dry and glazed.

Monti¹ calls attention to an enanthem in scarlet fever which is seen late on the first day or early on the second. It is a diffused, mottled reddening, which begins upon the uvula, spreads quickly over the hard and soft palate, covering the pillars of the fauces, and finally the mucous membrane of the cheeks.

Enlarged inguinal glands are a characteristic feature of this disease. The submaxillary lymphatic glands at the angle of the jaw are swollen and tender on palpation. The mucous membrane of the mouth is reddened.

The Urine.—There is febrile albuminuria present, which disappears as the temperature declines. The urine is scanty and high-colored.

Weight.—A gain in weight during the second or third week of scarlet fever should always be regarded with suspicion. Increase in weight, accompanied by an edema of the tissues or a general anasarca, implies an accumulation of water in the body. When beneficial results follow treatment there will be a decrease in weight. Daily weighing, therefore, should be a routine procedure during the convalescent stage.

The Rash.—This appears usually within the first twenty-four hours. It is first seen upon the neck and chest—less often upon the small of the back. It is a bright-scarlet pin-point flush, and occupies the sites of the hair follicles. The rash extends from above downward, spreading in a few hours to the arms; usually in twenty-four hours it reaches the trunk, legs, and abdomen. *A point to note* is that in contrast to measles and smallpox it is much less marked upon the face and cheeks. The immediate neighborhood of the nose and mouth remains free from the eruption and has a peculiar pallor, a marked contrast to the parts affected by the eruption. The dorsal surfaces of the hands and feet show the eruption. The palmar and plantar surfaces, though frequently injected, do not usually show the true punctate scarlatina rash.

The rash shows great variations. While it may show large or small, faintly scarlet colored patches lasting but a short time, the opposite more frequently occurs. When it is diffuse it may be of an intense scarlet or almost purple color. It frequently shows a tendency to stain the tissues, and minute hemorrhages may occur with the formation of petechiæ.

¹ Jahrb. f. Kindh., vol. vii, p. 227.

PLATE LI



Mottled eruption
from the arm of
same case.

Severe case of scarlet fever, showing eruption at its height. For strawberry tongue of same case, see Plate L. (Painted from a case in the Riverside Hospital.)

Septic Scarlet Fever.—This type is most commonly met with in children. The symptoms are of a more severe type. There is high and continued fever, with involvement of the pharynx and tonsils. Prostration is the vital symptom, showing the evidence of severe infection. There are marked cerebral symptoms, such as extreme restlessness, convulsions, or mild delirium. In this type we usually have persistent vomiting associated with general apathy. The fever rises suddenly to 105° F., or higher. The pulse becomes very small and rapid, from 140 to 160 per minute, although at times 200 per minute. The thirst is extreme, the

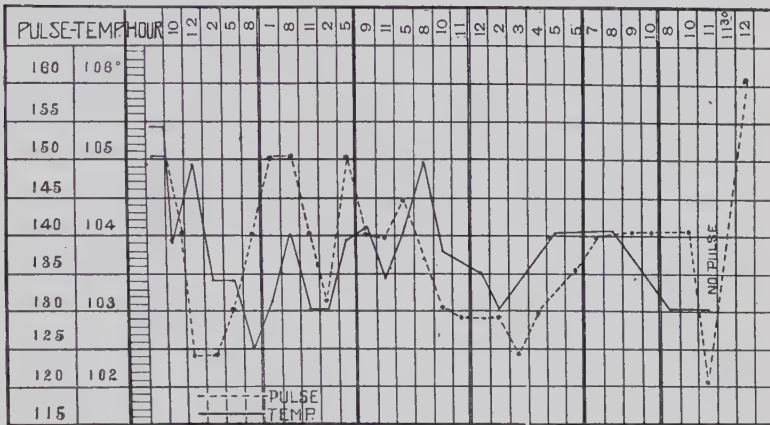


Fig. 179.—Septic scarlet fever with myocarditis, suppurative arthritis, double purulent otitis, general pyemia. Child 4 years old.

tongue is dry and gums parched. The throat, especially the tonsil, is deeply injected and frequently has scattered foci of exudate on the surfaces. The urine is concentrated, and invariably contains albumin.

Hemorrhagic.—This is the most malignant form and is very rare. The disease is very abrupt in its onset. The temperature reaches 105° to 107° F., and sometimes higher, or the temperature may be subnormal. This is especially noticeable in highly toxic cases in which cold extremities will be noted.

The pulse is greatly accelerated and is weak and intermittent. The cheeks and lips are blanched and may show cyanosis very early. The urine is scanty, high-colored, and albuminous, or may be completely suppressed. There are marked cerebral dis-

turbances, such as convulsions and active delirium. Frequently we have marked dyspnea, the respiratory rhythm being short and quick, due usually not to any change in the lungs at this time, but probably to irritation of the respiratory centers, according to Ausset. Ataxic and adynamic forms are characterized by early and profound constitutional depression, due to the effect of the toxin on the nerve centers, the symptoms rapidly assuming a typhoidal type.

In the hemorrhagic forms the exanthem acquires a dark-purplish hue. Small petechiæ, varying in size from a pin-head to a lentil, appear scattered irregularly over the body. The blood oozes from the gums, the sputum even being tinged with it, while epistaxis may be severe. Blood may be discharged from the bowels or the stools may be tarry in color.

Bleeding is frequently seen from the genitourinary tract or the urine shows the presence of blood. This form of disease is invariably fatal.

Scarlatina Sine Exanthemata.—Cases frequently occur in which every evidence of scarlet fever exists, but there is no eruption. Hensch states that he believes the eruption is always present and thinks that it is occasionally overlooked. The eruption is frequently of such an evanescent character that it entirely escapes notice, but a subsequent desquamation and nephritis will usually strengthen the diagnosis.

A case of *scarlatina sine exanthemata* was seen by me in a child about 4 years old which had been in apparent good health. There was no history of vomiting nor any gastric disturbance. No history of exposure to scarlet fever. When examined by me I found no evidence of scarlet fever. The throat was somewhat congested, but had no patches, nor was there any evidence of necrotic membrane visible in any portion of the throat. The lymphatic glands of the neck were not enlarged. *The urine was very scanty and contained more than 50 per cent. by volume of albumin.* Blood was also present in large quantity. There were also hyaline, epithelial, and granular casts present when a drop was examined under the microscope.

The child's urine was greatly diminished in quantity, hardly a tablespoonful being passed at one sitting. Diuretin and citrate of potash acted very well as diuretics, and later the secretion of urine was normal in both quality and quantity. At times it seemed as though the urine consisted of pure blood. Later the child developed an otitis media, which was preceded by a rise in temperature. The child recovered.

Scarlatina Papulosa.—Small, slightly elevated papules of a dark-red color develop at the site of the hair follicles. They are more

readily detected by the finger than by the eye, and are observed twelve to eighteen hours before the ordinary scarlatinal rash appears.

Scarlatina Variegata.—This form is marked by an extremely irregular distribution of the eruption, frequently associated with the development of well-defined macular areas of an intense red color, situated at the site of the hair follicles, and in many instances simulating the exanthem of measles.

Scarlatina Sine Febre.—Among extremely mild cases of scarlatina instances are frequently seen in which, *after a slight initial rise*,



Fig. 180.—Unusually severe desquamation. Willard
Parker Hospital.

the disease progresses without any subsequent elevation of temperature above 98.5° to 99° F., every other symptom being present, but in a mild degree.

Henoch reports 4 cases out of 175 with irregularities of temperature. *Fever of an inverted type* has been reported by Henoch, who noted the temperature curve quite the reverse of normal, in which the temperature was higher in the morning than in the evening.

Scarlatina Sine Angina.—This form of scarlatina has very slight throat symptoms or so insignificant as to appear almost absent. A slight congestion of the throat is visible, and usually a faint enanthem is present early in the disease.

The tonsils are not enlarged, but there is an almost constant *enlargement of the papilla* at the tip and edges of the tongue—an *important diagnostic aid*.

Desquamation.—The desquamation of the skin in scarlatina begins over those areas on which the rash was first seen, namely, the thorax and neck. Thus, we will frequently find evidences of desquamation on one part, while another part of the body has distinct traces of the rash.

Character of the Desquamation.—On the neck, face, and trunk the epidermis peels off in fine, flaky scales. This is known as *desquamatio furfuracea*. This is similar to the desquamation found in measles. The extremities, about the hands and feet, show the characteristic desquamation. The epidermis peels off or can be stripped off in shreds of varying lengths. This is known as *desquamatio membranacea or lamellosa*.

Duration of Desquamation.—This varies greatly and is influenced by the severity of the infection and the intensity of the eruption. It persists longest where the epidermis is thick, namely, about the hands and feet. At times it will be necessary to soak the hands and feet, then rub them with pumice stone to hasten the removal of the epidermis.

The length of time for complete desquamation may be from six to eight weeks. It may be of a shorter or longer duration. Repeated desquamation is not uncommon, so that we can say there is secondary and, less frequently, tertiary desquamation.

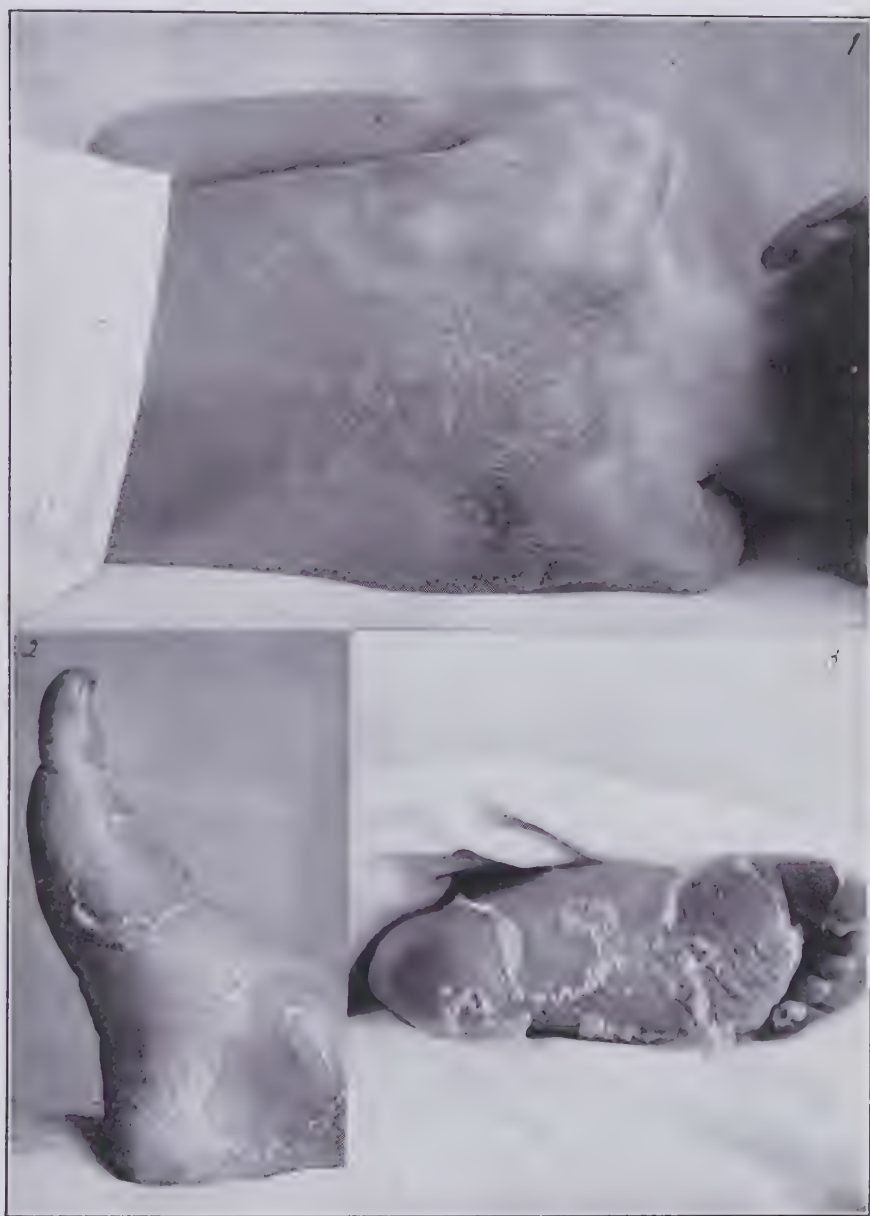
Diagnosis.—When fever exists accompanied by an inflamed throat and an eruption over the body, then the diagnosis of scarlet fever can be made. About one week later we have desquamation. The most characteristic early symptoms of a typical scarlet fever are: Intense redness of the faucial mucous membrane, sore throat, early and persistent vomiting, fever, thirst, and increased pulse-rate. The tongue has a very characteristic strawberry appearance. (See Plate L.) Sometimes an attack of scarlatina is ushered in by convulsions. Older children complain of an intense headache. There is marked constitutional depression and aching of bones. Von Leube maintains that vomiting occurs more often as an initial symptom in this than in any other disease, excepting pneumonia. There is nothing peculiarly characteristic in the early temperature of scarlet fever. It remains elevated after a sudden rise, and subsides gradually

PLATE LII



Scarlet fever. Desquamation in a severe case. From the Willard Parker Hospital.

PLATE LIII



Scarlet fever, Willard Parker Hospital.

1. Furfuraceous desquamation. 2. Circinate desquamation.
3. Flaky desquamation.

(Courtesy of *Howard Fox*.)

by lysis towards the end of the first week, unless some complication develops.

The Throat.—Scarlatina is usually seen very early in the pharynx and fauces. This takes place whether we are dealing with a mild or severe infection.

The tonsils and fauces are swollen and covered with necrotic patches resembling diphtheria. There is intense congestion and reddening of the palate. The adjacent lymph glands are swollen

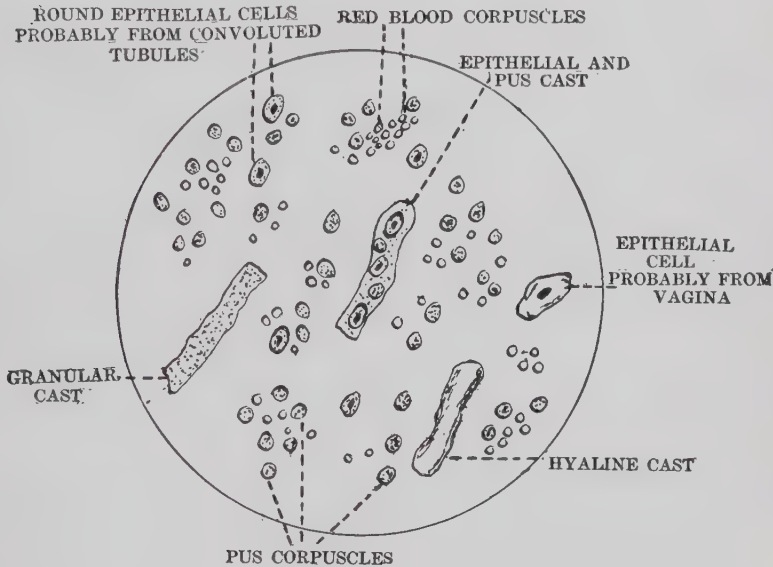


Fig. 181.—Drop of urine from a case of post-scarlatinal nephritis.

and palpable and usually very tender. When in doubt as to the nature of an eruption of a scarlatinal nature the condition of the throat will usually confirm or exclude the diagnosis of scarlet fever. If the throat is normal one can exclude scarlet fever. We may, however, have scarlet fever with its patches on the tonsils and fauces without an eruption.

Complications.—*Nephritis.*—The most frequent complication of scarlet fever is nephritis. In many cases an acute renal congestion will be found in which albumin, a few red blood cells, and an occasional cast is present. In such cases the total quantity of urine in twenty-four hours should be noted, likewise the total liquid intake.

All febrile scarlet fever cases show albumin in the urine. This transitory albuminuria is part of the acute infection and should not be regarded as distinct nephritis.

Some authors describe acute renal congestion under the name of acute catarrhal nephritis.

The earliest symptoms of nephritis are: Rise of temperature, occurrence of edema, however slight, involving particularly the lower eyelids, with distinct puffiness of the eyes. Sometimes the whole face is swollen and bloated. The feet and legs are edematous, so also the scrotum and penis in the male, and the labia majora in the female. Such edema may also be seen on the dorsum of the feet and upon the knuckles. There is usually pitting on pressure.

The urine is very high colored and greatly diminished in quantity, so that several teaspoonfuls only may be passed in twenty-four hours. The reaction is acid. Specific gravity is from 1.006 to 1.065, the latter being rare. The amount of urea is under 2 per cent. Albumin is present from 0.5 to 1 per cent. and higher. The diazo reaction is of no value in scarlet fever.

Microscopically there may be present hyaline, epithelial, granular and blood casts, fragmented renal epithelium, white and red blood corpuscles; the latter in varying numbers; uric acid and oxalic acid in crystalline and amorphous form, and more or less granular *débris*.

Cases are seen, now and then, in which *almost normal conditions* of the urine prevail, and still edema exists.

Nephritis usually exists but a few weeks, although obstinate cases may continue for months and even years.

The prognosis in a case of post-scarlatinal nephritis must be given with caution. Uremia, when occurring during nephritis, is a grave symptom. It is usually preceded by vomiting, stupor, and peculiar twitching of the facial muscles.

The pulse is slow; the temperature subnormal; the tongue is dry. Sometimes just the reverse exists and there is high fever, very frequent and small pulse; the respirations are small and hurried, and the skin is dry.

Convulsions may develop, clonic in character, of varying intensity, involving the face and extremities as a whole. Sometimes only distinct groups of muscles are involved. Cyanosis is marked, complete suppression of urine follows, coma ensues, and these cases usually end fatally.

Anasarca is frequently associated with or subsequent to edema. We frequently have serous exudations into the serous cavities—pleura, pericardium, or peritoneum. Edema of the lungs, sometimes edema of the larynx results, and is usually fatal. Mayr mentions edema of the pia mater and ventricles of the brain.

Septic Nephritis.—Where the scarlatinal virus causes a general toxemia, and we have grave throat symptoms accompanied by necrotic deposits on the tonsils and pharynx, there are always swollen glands. Nephritis develops from the intensity of the

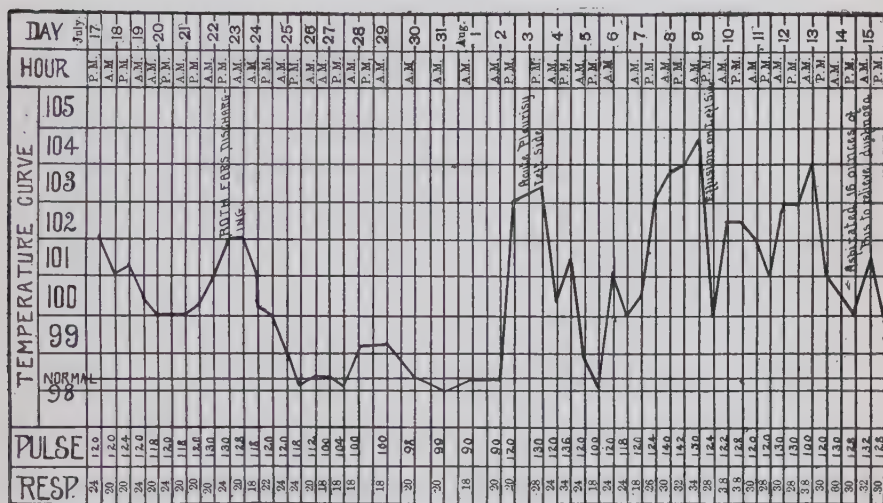


Fig. 182.—Septic nephritis from Riverside Hospital.

infection caused mainly by the streptococcus pyogenes. In many instances death occurs before well-defined symptoms of nephritis are made out. In such cases there is no dropsy and uremic symptoms are absent. In rare instances the urine is normal during the entire attack until a post-mortem shows the existence of nephritis.

When functional disturbance of the kidneys is suspected the following method¹ of testing elimination is advised: 0.5 cubic centimeter of a solution containing 3 milligrams of phenolsulphonephthaline (half the amount used in adults) is injected deeply into the lumbar muscles.

¹ Amer. Jour. Dis. of Children, Sept., 1917.

Catheterization with a soft rubber catheter is performed at the end of 70 minutes, or 130 minutes, or both, except in some older children who are able to void.

Scarlatina with Other Exanthemata.—Cross infections are frequently noted. Measles, chicken-pox, or smallpox are met with. Corlett depicts a case of scarlatina with chicken-pox.

Cross infections have been seen many times during my service in the scarlet fever wards of the Riverside Hospital—scarlet fever and whooping-cough, scarlet fever and measles very often, scarlet fever and diphtheria as well.

A streptococcus is usually present. It has not been possible to reproduce the disease as with the Klebs-Löffler bacillus in diphtheria. Not infrequently the Klebs-Löffler bacillus will be found associated with the streptococcus.

Complicating diphtheria should be treated regardless of the scarlet fever. Lemoine found the streptococcus pyogenes in 93 cases out of 117 studied by him. The Klebs-Löffler bacillus was found in addition in 5 cases of this series, and the bacillus coli communis in 9 cases.

Otitis.—Extension of the infection from the pharynx through the Eustachian tubes frequently occurs. As a rule, *the younger the child*, the greater the danger of otitis. According to Bader and Guinon, the mild or catarrhal form occurs in 33 per cent. of all cases of scarlet fever. The purulent form is less common, occurring in 4.5 per cent. of all cases.

Caiger, reporting 4015 cases of scarlet fever, noted ear discharge in 11.05 per cent. In a series of 397 cases observed by me, including severe, malignant, and all complicated varieties, there were 82 middle-ear discharges, 68 purulent and 14 catarrhal.

About 20 per cent. of all cases seen by me had middle-ear trouble. It is important to have the ear examined when high fever persists during an attack of scarlet fever. Some children will roll the head, others will try to put their finger in the ear. The neighboring lymphatic glands may be enlarged, palpable and tender. After a few days unless relieved by incision, the tympanic membrane may rupture spontaneously. The acute symptoms then usually subside. When, however, the discharge becomes purulent (otitis media suppurativa), then the condition is serious, and requires careful treatment.

The temperature ranges between 100° and 104° F. and shows a marked fluctuation of a remittent character. There may be

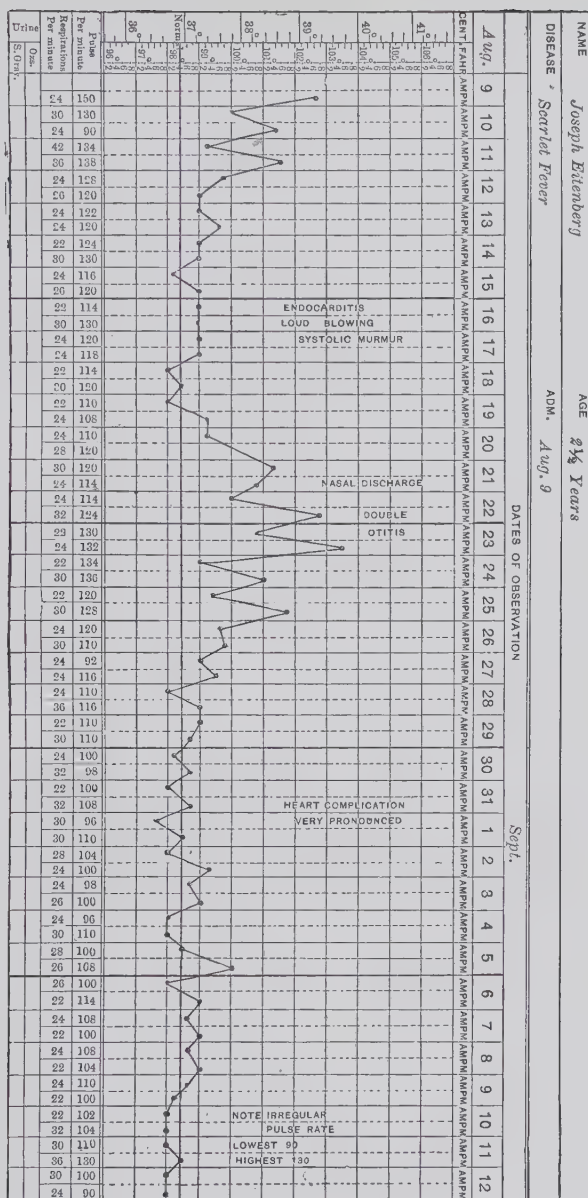


Fig. 183.—Chart showing temperature and complications in a case of scarlet fever. From author's service at the Riverside Hospital.

rigors. The pulse becomes rapid and irregular. These symptoms continue from day to day, and unless an operation is performed these cases will end fatally, due to the development of meningitis.

Mastoid Infections.—Virulent strains of the streptococcus and pneumococcus often attack the mucous membrane leading to the middle-ear and to the external ear. Occasionally a staphylococcus will be found to be the invading organism. In one of my cases seen recently we encountered an almost pure culture of bacillus pyocyaneus. This latter condition is extremely rare. These bacteria always accompany both the severe and mild forms of infection and predominate in the nose and throat. The proximity of the Eustachian tube permits these bacteria to penetrate into the deeper structures and thus reach the mastoid. It is therefore important to have in mind the ease with which a middle-ear disease may begin.

An inflammatory swelling sometimes appears behind the external ear, situated over the mastoid region. Associated therewith, a rise of temperature, local tenderness, with more or less forward projection of the ear, and occasionally local suppuration, with abscess formation takes place. With this group of symptoms and signs, involvement of the mastoid must be considered as a probability.

Daily examination of the middle-ear as well as the mastoid region should be made, and the slightest tenderness on palpation of the mastoid should be noted. Rigidity of the sternocleidomastoid, and opisthotonus may sometimes so mask the symptoms of an acute mastoiditis that a lumbar puncture is justified in eliminating a complicating meningitis.

Blood Examination.—The leucocyte count and the differential count is of great importance in studying the progress of an acute otitis. Mastoid involvement can be noted by an increase in the white cell count, and also by a study of the polymorphonuclear cells. An increasing leucocytosis with a high polynuclear percentage points to the formation of pus and indicates an extension of the inflammatory process to the mastoid cells. When chills and high fever of a remittent character exist, then a blood culture should be taken to determine the presence of a streptococcus hemolyticus indicating a sinus thrombosis.

No general practitioner should assume the risk of taking care of an acute otitis with mastoid involvement, without remember-

ing the dangers of complications involving the labyrinth with its accompanying destructive process resulting in deafness.

To stop itching of the desquamated skin during scarlet fever, remove as much of the desquamated skin as possible by scrubbing with soap and water, or with pumice stone, then dry thoroughly and sponge the surface with the following:—

| | | |
|----|---|--------|
| R | Menthol | 1 gram |
| | Alcohol | 1 pint |
| M. | Sig.: Sponge every hour until relief is afforded. | |

One per cent. mentholated vaseline or mentholated cold cream is soothing and may be used instead of the lotion.

Angina Pseudomembranosa (of Streptococcic Origin).—False membranes upon the tonsils or pharynx are seen in the severe and septic types of this disease. It is simply a necrotic inflammatory deposit. On the second day the mucous membrane of the pharynx is intensely reddened and congested. The tonsils, which are much inflamed and swollen, show scattered, irregular patches of gray or grayish--white exudate, completely occluding the tonsillar crypts over a more or less limited surface. One or both tonsils may be affected. In many instances the pharyngeal inflammation from the beginning shows an extreme grade of intensity. This may spread over the posterior pharyngeal wall, the hard palate, and the mucous membrane of the posterior surface of the cheek; also, to the posterior nares and the Eustachian tube, with resulting extension of the inflammatory process to the middle ear. There is a very foul odor to the breath, and usually a thin, acrid secretion from the nostrils, causing excoriation, fissures, and, rarely, rhagades.

The nostrils may be occluded and the mouth held open in an attempt to breathe.

Angina Scarlatina Membranosa (of True Diphtheritic Origin).—This should be regarded as a true diphtheritic complication and treated as diphtheria (see chapter on Diphtheria).

Cervical Adenitis.—The cervical lymph glands are usually enlarged and tender on palpation. In severe forms of scarlet fever the infiltration of the glands may be so severe that it will be difficult to open the mouth. The swelling also involves the angle of the jaw. The muscles of the neck may be so rigid as to render the head immovable. Sometimes the parotid glands are also involved. Frequently the inflammatory condition per-

sists and suppuration occurs, resulting in so-called phlegmonous inflammation. Even when freely incised there is danger of pus burrowing beneath the connective tissue. Sometimes a rapid and diffuse cellulitis with excessive infiltration of the deeper tissues is associated with the suppurative process.

Schamberg, in a study of the lymphatic glands in scarlatina, found the various groups enlarged in the following proportion in 100 cases:—

| | Per cent. |
|--------------------------|-----------|
| Inguinal glands | 100 |
| Axillary | 96 |
| Maxillary | 95 |
| Posterior cervical | 77 |
| Anterior cervical | 44 |
| Submaxillary | 36 |
| Epitrochlear | 26 |
| Sublingual | 25 |

As a result of the analysis of these 100 cases he finds that the maxillary glands commonly attain the largest size, and also most frequently undergo suppuration. In all cases examined on the second and third day of the disease the enlargement of the lymphatic glands was well marked.

Retropharyngeal abscess occurs occasionally.¹

Angina Ludovici (Tippet Neck).—This may occur about the fifth day of the disease, though more commonly seen early in the second week of the attack.

The skin is indurated, glossy, and may pit on pressure, though it may give no sense of fluctuation. The process may be limited to the angle of the jaw or involve the entire neck, it may extend downward to the clavicles and upward along the sides of the face and head rendering the head almost if not wholly rigid. The diffuse cellulitis of the deeper tissues constitutes one of the gravest complications of scarlet fever, proving almost invariably fatal. Death results from a rupture of one of the large vessels, the jugular vein or internal carotid artery, or, as a result of thrombosis or embolism, with fatal meningitis or pyemia. The greater the toxemia, the more pronounced the lymphatic enlargement.

Noma (Stomatitis Gangrenosa).—This gangrenous process has been seen by me many times in the scarlet fever wards of the Willard Parker Hospital. It is a destructive process and one

¹ Jahrbuch, f. Kinderheilkunde, vol. x, p. 108.

fraught with great danger. This disease is described in extenso in the chapter on Diseases of the Mouth.¹

TABLE No. 57.—COMPLICATIONS IN SCARLET FEVER. WILLARD PARKER HOSPITAL.

| Year | 1910 | 1911 | 1912 |
|---|------|------|------|
| Number of cases | 2302 | 1984 | 2127 |
| EYE COMPLICATIONS. | | | |
| Conjunctivitis (purulent) | 86 | 68 | 1 |
| Conjunctivitis (gonorrheal) | 14 | 13 | 3 |
| Conjunctivitis (catarrhal) | 28 | 142 | 84 |
| EAR COMPLICATIONS. | | | |
| Mastoiditis (operative) | 14 | 25 | |
| Mastoiditis (non-operative) | 8 | 37 | 25 |
| Otorrhea (purulent) | 180 | 194 | 249 |
| Otorrhea (diphtheritic) | ... | 5 | 14 |
| THROAT COMPLICATIONS. | | | |
| Positive throat cultures on admission | 358 | 33 | 117 |
| Requiring intubation | 11 | 7 | 74 |
| Intubation cases recovered | 8 | | |
| Tonsillitis | ... | 89 | 74 |
| Regurgitation | ... | 27 | 22 |
| Adenitis (cervical) | 512 | 274 | 120 |
| CARDIAC COMPLICATIONS. | | | |
| Endocarditis | 32 | 61 | 49 |
| Myocarditis | 29 | 41 | 56 |
| Pericarditis (with effusion) | 2 | 5 | 1 |
| Pericarditis (fibrinous) | 3 | 4 | 3 |
| Bradycardia | ... | 25 | 16 |
| Arrhythmia (slight) | ... | 125 | 369 |
| NEPHRITIC COMPLICATIONS. | | | |
| Albuminuria (febrile and transitory) | 391 | 357 | 281 |
| Nephritis (marked) | 53 | 34 | 51 |
| Uremic convulsions | 11 | 9 | 8 |
| GENERAL COMPLICATIONS. | | | |
| Arthritis | 85 | 145 | 148 |
| Delirium | 17 | 95 | 72 |
| Erysipelas | 11 | 1 | 11 |
| Pneumonia | 34 | 160 | 114 |

¹ See Noma, page 236, vol. i.

GENERAL COMPLICATIONS—*Continued.*

| | | | |
|----------------------------|----|----|----|
| Empyema | 4 | 3 | 4 |
| Measles | 86 | 94 | |
| Typhoid on admission | 4 | 3 | 1 |
| Antitoxin rashes | | | |
| Morbilliform | | 10 | 21 |
| Scarlatiniform | | 38 | 15 |
| Urticarial | | 30 | 45 |
| Erythema multiforme | | 47 | 27 |

Precarthritis Rash.—During the second or third week of scarlet fever when convalescence is fairly well established, a secondary rash around the joints may be seen. There is usually fever, 100° to 101° F., and tenderness of the larger joints. This tenderness increases from day to day until an acute inflammatory arthritis is seen.

Scarlatinal synovitis (so-called scarlatinal rheumatism or pseudorheumatism) is occasionally met with. Ashby met with this condition in 2 per cent. of his cases.

Hodge found synovitis in 117 out of 3000 cases studied, or 3.2 per cent. There are two distinct forms:—

(a) Simple catarrhal or serous synovitis.

(b) Suppurative or purulent arthritis.

The streptococcus pyogenes has been found in both forms in pure culture and combined with other micro-organisms.

This complication occurs more often in children over 5, and is rarely met with in children under 3, according to Holt.

The symptoms met with are: Pains in the affected joints, swelling, which may or may not be marked with slight impairment of motion, some redness, and a slight rise in temperature.

Owing to an effusion of serum, large joints, such as the knee and shoulder, remain swollen many weeks. When suppuration develops in the involved joint, Henoeh claims that it is due to emboli, following septicemia.

Anaphylactic Reaction.—After the injection of vaccines or serums, or after the ingestion of eggs or cereals or other protein to which the body is sensitive an anaphylactic eruption of an erythematous nature may appear. The rash with its associated edema of the skin greatly resembles scarlet fever.

The differential diagnosis rests on the absence of a sore throat, absence of the enlarged cervical glands, and the absence of the premonitory symptoms such as vomiting. There may be a rise

in temperature. Such eruptions, however, last but a few days and there is no desquamation thereafter.

Drug Eruptions.—Many drugs give rashes in susceptible children. Antipyrine, quinine, and opium give rashes which are non-febrile in character. An eruption is frequently seen following the use of belladonna or atropia. This eruption is a generalized flush simulating an erythematous scarlet fever but it is non-febrile in character. The throat, glands and the tongue do not show the characteristic symptoms of scarlet fever.

Course.—Scarlet fever usually runs its course in about six weeks from the beginning of illness. The febrile stage usually subsides during the first week, rarely later than the tenth day. No case of scarlet fever should be considered terminated until normal conditions exist for at least two weeks after desquamation is complete. The great susceptibility of the organs to congestion and inflammation, and the devitalized state of the body following this disease invite complication, and may prolong convalescence weeks and sometimes months.

During my service at the New York City Hospital I have seen many children in the wards several months despite the best of care and excellent hygiene.

Prognosis.—It is very difficult to determine the outcome of a case, especially at the beginning of scarlet fever. A mild rash may have serious complications and a severe rash may run a very mild course without complications.

Individual susceptibility plays an important part in forming an opinion as to the outcome of any case of scarlet fever. The following symptoms should influence an unfavorable prognosis: Continued hyperpyrexia; continued vomiting; delirium or other cerebral symptoms, such as convulsions or stupor; an irregular anomalous or poorly developed rash, if intense, suggests *extreme virulence*; an *extremely rapid and feeble or irregular pulse*. Great stress should always be laid on the *condition of the heart*. Bronchopneumonia, diphtheria, kidney or ear complications should always influence our opinion regarding the outcome of the case.

Treatment.—*Isolation.*—In New York City cases of scarlet fever are excluded from school for at least five weeks, or until desquamation is complete and all purulent discharges have ceased. If quarantine is observed by the family, children and others who have had the disease may return to school. If children or other members of the family who have not had scarlet fever are imme-

diately removed to another address, they may return to school at the end of five days if in the mean time they do not develop the disease, but they must present a special school certificate issued by the department. If they continue to reside at home, they cannot return to school until the case of scarlet fever has been officially discharged by the Department of Health.

Hygiene.—The temperature of the room should be from 68° to 72° F. Fresh air must be admitted; hence proper ventilation is imperative. In winter the patient should be well protected from draughts. Sunshine is imperative, although the eyes should be shielded from direct sunlight. A tepid sponge-bath can be given every morning, and also in the evening, especially if there is profuse perspiration. The child's linen should be changed once a day. When the eruption causes itching, the body should be rubbed with cold cream, carbolated vaseline, or the following recipe is very useful:—

| | |
|--|---------|
| R Calamine | 1 dram |
| Ung. aq. rosæ | 1 ounce |
| M. et ft. ungt. | |
| Sig.: Apply over the body once or twice a day. | |

Forchheimer advises the addition of menthol, 1 per cent., to relieve itching. This can be added to the above.

Fever.—High temperature may be reduced by tepid sponging. When the temperature reaches 105° F. a warm bath at a temperature of 100° F. should be given. Following the bath the patient should be wrapped in a warm blanket until perspiration results. The popular fear of driving the rash in by bathing is unfounded. The pulse should be noted during the bath, and if signs of weakness are noted the bath should be immediately discontinued, otherwise the duration should be about two to three minutes, and the child's back and extremities rubbed while immersed in the water.

If the temperature is taken before, and one-half hour after, the bath the effect of the same will be apparent. As a rule a tub bath should not be given oftener than twice a day unless delirium, stupor, convulsions or high fever exist. If the heart action is bad and a competent nurse cannot be obtained then a tepid sponge bath may be given or a tepid sheet may be wrapped around the body.

The temperature should be noted hourly as an indication of the result and a guide as to the frequency of such treatment.

Antipyretic drugs such as phenacetine, and antipyrine are cardiac depressants and should not be used. The strength of the patient depends on the condition of the heart, hence, even though fever can be reduced by drugs one must look ahead for the after effects such as cardiac depression which weaken our patient.

The instillation of one pint of tepid water into the colon or rectum, twice a day, will not only cleanse the intestine but reduce temperature.

The following mixture will aid diaphoresis besides stimulating the kidneys:—

| | |
|------------------------|----------|
| ℞ Tinct. aconiti | 20 drops |
| Spir. mindereri | 2 ounces |
| Syr. limonis | 1 ounce |

M. Sig.: Teaspoonful every hour until sweating is produced, for a child 5 to 12 years old. Younger children half the dose.

The general plan of treatment will consist in studying symptomatic requirements and aiding organic weakness, especially functional disturbances.

The bowels should always receive attention, whether constipated or not; a dose of calomel or several wineglassfuls of citrate of magnesia or a tablespoonful of Pluto water are excellent laxatives and diuretics, and may be given night and morning.

To Hasten the Eruption.—If a mild eruption exists that is not distinctly characteristic a hot bath should be ordered, which will hasten the appearance of the rash. The bath should be started at a temperature of 100° F., and hotter water added until the temperature is raised to 105° F. or over, if it is well borne. Following the bath the child should be wrapped in warm blankets for at least one-half hour.

Heart.—When the first sound of the heart becomes weak, or the two sounds lose their normal tone, stimulation must be commenced. The same is true if the pulse is weak; $\frac{1}{100}$ grain strychnine can be given every three hours, or oftener, if necessary. It must be borne in mind that children tolerate strychnine in toxemic conditions in very large doses. It is a good plan to give coffee with the strychnine or to combine it with caffeine or musk.

Two to five drops of a 1 to 1000 solution of adrenaline may be injected hypodermically, in a child two years old. The smallest

dose should first be given, and the pulse as well as the color of the skin noted. If no cyanosis results the second injection may consist of 3 drops of the solution. Digitalis is indicated if the pulse is weak and of low tension. It should not be used continuously as it irritates the stomach, and in its stead tincture of strophanthus should be used. An excellent drug is digifoline. As each tablet represents $1\frac{1}{2}$ grains of standardized digitalis leaves we should begin with one-half tablet and repeat the dose in two hours until the effect on the heart or pulse is perceptible. I have elsewhere, in the article on Pneumonia called attention to the baneful results of camphor injections. The danger of camphor tumors (camphoma) has been described by Fordyce, besides other authors. Whisky is tolerated in extremely large doses.

Coma.—In coma the subcutaneous use of sodium-cafeine-benzoate stimulates the heart and arouses the child from stupor. It also stimulates diuresis. If the urine is scanty, even though there is neither edema nor puffiness of the skin, no drug will equal small doses of warm, black coffee followed in ten minutes by warm milk. This will stimulate diuresis and aid in the elimination of urine. When bloody urine exists suprarenin or adrenaline can be used in very small doses. Spartein sulphate, $\frac{1}{4}$ to $\frac{1}{2}$ grain, injected hypodermically, with distilled water, is useful in cardiac weakness.

Nephritis.—When the first symptom of nephritis appears we must aid the kidneys, skin, and bowels by eliminative treatment. In this manner only can the blood-pressure be reduced. The child must be kept in bed, well blanketed. The diet should consist of milk, milk and seltzer, milk and cereals, and buttermilk. If the stomach is irritable, then the milk should be peptonized. When extreme repugnance to milk exists, vanilla flavoring should be added to the milk. For thirst give whey, lemonade or orangeade.

To stimulate diaphoresis, hot baths aided by hot packs will be serviceable. The temperature of the bath should be kept at 103° F. The child is immersed two to three minutes. The surface of the body must be continuously rubbed during the bath. The child when taken out of the bath is placed between hot blankets for one-half hour, so as to aid diaphoresis. To give the *hot pack* the child should be wrapped in a blanket wrung out of hot water, temperature 100° F., and then covered with a dry

blanket, over which is placed a rubber cloth. The blanket can also be covered with oiled-silk.

The pulse should be watched during the bath, and the child should be removed at once if signs of weakness appear.

The Hot-air Bath.—Place the child in bed and cover with two blankets. On either side place hot-water bottles or hot bags of sand so protected that the child cannot be burned. Over these place a rubber cloth or a raincoat. Over the rubber place another blanket. Sweating occurs very easily and very quickly in this manner. In an emergency the ordinary flat-iron can be used, instead of the hot-water bottles, for a hot-air bath.

Pilocarpin and jaborandi are such cardiac depressants that they are merely mentioned to be condemned. Nitroglycerine is very valuable. When a general dropsy appears, the danger of effusion into the serous cavities must be borne in mind. When necessary the effusion should be relieved by aspiration. The quantity of urine passed is the most important point which should guide us in determining the result of the treatment, hence the amount of liquid intake and of urine passed in twenty-four hours should be reported.

Liquids should not be forced under the impression that we are stimulating diuresis. We can stimulate the kidneys by careful dieting, and by restricting liquids. The following case occurred during my service, and will illustrate the treatment.

Mary S., 5 years old, was ill three days before admission to the Riverside Hospital. Diagnosis: Scarlet fever. Her diet consisted of milk 96 ounces in twenty-four hours. She later received also soup and cereals. An injection of 10,000 antitoxin units was given. Three days later the child complained of painful joints. The diet was restricted to milk.

The urine showed a specific gravity of 1018, contained free blood and abundant granular casts. Diagnosis: Acute renal congestion. Medication consisted of agurin 5 grains every four hours, nitroglycerin $\frac{1}{100}$ -grain one-half hour before hot bath. Liquids were forced. The pulse became weak. Strychnine $\frac{1}{80}$ -grain, Whisky 1 dram, was ordered. The following day many coarse granular casts and much free blood were found in the urine. Whisky was discontinued.

The diet until this time consisted of 96 ounces milk in twenty-four hours. Nephritis and edema were present. About 32 ounces of urine were voided in twenty-four hours. The following day *liquids were restricted to 22 ounces*; in addition cereals, bread, prunes, and peaches were given. The total urine passed within the twenty-four hours was 35 ounces, the following day the same diet was given; total urine passed was 40 ounces. Thus by restricting liquids we aided diuresis.

If the quantity of urine increases and the percentage of albumin decreases, then our patient is improving. The disappearance of blood corpuscles and casts denotes improvement. One of the best drugs to aid diuresis is diuretine, to be given in doses of 3 grains for a child two years old, and gradually increased until 5 grains per dose is administered. This drug should be given at least three times a day to stimulate the kidneys. Another drug highly recommended is acet-theocine. It can be given in the same dosage as diuretine and the dose repeated several times a day. In a certain class of cases agurin acts well, and can be recommended, because it does not disturb the stomach. Now and then I have noticed that marked vomiting followed the administration of almost any drug during the course of nephritis; hence, great care should be taken not on that account to condemn a drug during the course of nephritis with toxic or uremic symptoms.

Vulvo-vaginitis Following Scarlet Fever.—At the Riverside Hospital, out of 100 cases of scarlet fever there were 15 cases suffering with vulvo-vaginitis. In these there was a well-marked purulent discharge upon the deeper parts of the vulva and at the vaginal opening, with some redness and irritation. With this there was a distinct rise of temperature and some constitutional disturbance. The cases all yielded promptly to treatment, proving especially amenable to simple astringent solutions rather than to more active germicides.

It is not uncommon to find cases of vulvitis and also vaginitis occurring in the scarlet-fever wards for which there is no adequate explanation.

Vulvo-vaginitis occurs as a distinct complication to scarlet fever. When it occurs it shows a distinct rise of temperature and also a peculiar constitutional disturbance. When this is contrasted with the symptoms of a catarrhal otitis the similarity of both conditions must be apparent. Not only do we have similar bacteriological findings, but the infection manifests itself in a rise of temperature and general systemic disturbance.

Similarly a purulent vaginitis may occasionally show a gonococcus infection.

In this disease more than in any other the strictest attention to hygienic rules is demanded. If it is an infant that is so afflicted, the pads should thoroughly cover the vulva and be saturated with a weak solution of bichloride. This pad should be adjusted

with the aid of a T-binder. If there is severe itching from excoriation and the child has a tendency to scratch, the hands should be guarded so that the infection cannot be carried from the genital tract to the eyes.

Labarraque's solution is a very valuable remedy. It may be used in a 5 per cent. solution. My plan has been to add about 1 ounce of chlorine water to 1 pint of lukewarm water and irrigate morning and evening, noting the effect. If the discharge is not lessened thereby, the injection should be given three times a day.

Astringent solutions, such as sulpho-carbolate of zinc, sulphate of zinc, or sulphate of copper, using 1 grain to the ounce, are useful. When there is intense itching it is a wise plan to instill a 2 per cent. ichthyol-glycerin solution into the vagina after the same has been thoroughly washed with one of the above astringent solutions.

Argyrol, 25 per cent. solution, has been used as an injection several times a day with remarkable success at the Willard Parker Hospital.

The vaccine treatment consists in injections of gonococcus vaccine. These injections are given subcutaneously in doses of 50 million and repeated daily until 1000 million bacteria have been injected. There is no specific action following these injections. My experience in some cases has been good, in others disappointing. The discharge was diminished; in some cases it disappeared. The gonococcus, however, persisted.

*Salt-free Diet.*¹—When the kidneys are affected, their activity is diminished, and an excess of salt is stored in the tissues. As each molecule of salt requires a certain quantity of water to hold it in solution, such water will be abstracted from the tissues, giving rise to the dropsical condition. By giving a diet which is free from salt, we can decrease the edema.

Generally speaking, during the febrile stage and until the end of the second week, an exclusive liquid diet of milk or milk and barley water should be given. If milk is not well digested, then whey should be tried (see Dietary). Later, beef soup, mutton or chicken broth, buttermilk, all gruels, fruits, fruit jellies, toast, weak tea, weak coffee, cocoa, and chocolate. For thirst the child may have plain water or Apollinaris, Vichy, or lemonade. The

¹ L'Echo Medical du Nord, January 20, 1907, p. 25.

tendency to nephritis seems to be lessened by giving our patients a milk diet; hence this fact must be borne in mind. Steak juice and egg albumin, diluted with water, can be given later on.

Restorative treatment, such as iron, strychnine, malt extract, and codliver oil, should be given after the symptoms of nephritis subside. The child should be kept well protected for at least two months after the first symptoms appear.

As soon as the temperature falls to the normal point we can give:—

R. Mist. ferri et ammonii acetatis,
 Glyceriniāā 1 fluidounce
 Aquæq. s. ad 4 fluidounces
 M. Sig.: A teaspoonful or more every three hours, in water.

Or Basham's mixture may be given:—

R. Tinct. ferri chloridi,
 Acidi acetici dil.āā 1 fluidram
 Liq. ammonii acetatis 6 fluidrams
 Aquæq. s. ad 6 fluidounces
 M. Sig.: Tablespoonful three times daily for a child six years old.

The Throat.—When children are old enough to use a gargle they should be given a mild antiseptic solution, such as table-salt solution, using a pinch of salt to a wineglassful of lukewarm water. Gargle every hour.

A spray consisting of normal saline solution directed against the pharynx and tonsils every hour is useful. If spraying is difficult, then the throat may be swabbed with cotton dipped in saline solution. High temperature will frequently subside if the nasopharynx is properly irrigated.

The septic accumulations are very serious and cause profound toxemia unless cleansed thoroughly.

In young infants where gargling is impossible, an alkaline solution such as Dobell's solution or alkalol diluted with water can be dropped with a medicine dropper into each nostril. This should be repeated every two or three hours depending on the amount of discharge in the nose. Cautiously used, five or ten drops may be instilled at one time without danger of forcing an infection, through the Eustachian tube, into the ear.

Tincture of iodine or Lugol's solution carefully applied to the tonsils and pharynx, once only, is advised. Local applications of 50 per cent. resorcin solution in alcohol, applied on cotton several times a day, are also advised.

Nasal Douching.—My preference has always been for mild saline douches. Hold the child firmly and cleanse the nares with a nasal tip attached to a fountain syringe, at a height of no more than two feet. Permanganate of potash, several crystals to a pint of water, is very good when there is fetor.

R Borax 1 dram
 Warm water 1 pint

M. Sig.: Douche the nostrils, at a temperature of 102° F. several times a day.



Fig. 184.—Method of nasal syringing employed in the scarlet fever ward of the Riverside Hospital.

Douching the nostrils will remove loosened necrotic membranes and foul discharges. Swollen cervical glands will be greatly benefited by cleansing the posterior nares with this alkaline solution.

Swollen Lymph Glands.—To relieve the enlarged cervical glands a warm poultice consisting of flaxseed meal, to which a little oil and hot water is added, and spread between two layers of cheesecloth and applied over the enlarged glands is very soothing and will reduce the swelling. Such poultices should be

renewed every hour. To retain the heat an external layer of oiled silk is necessary.

In some instances the local application of compound iodine ointment thoroughly rubbed into the gland once daily will reduce swelling. Regarding the applications of ice-bags—cold seems to relieve pain but it does not soften the glands as readily as warm fomentations.

Immunity from Diphtheria.—If a Schick test has not been made it should be made early in the disease. My own preference is for giving 1000 units of antitoxin, as a prophylactic, to every case showing necrotic patches on the tonsils.

Diphtheria.—If diphtheria complicates scarlet fever, then the usual treatment of diphtheria should be instituted (see chapter on Diphtheria).

Septic Scarlet Fever.—In septic cases where the system is overwhelmed with toxin, we frequently have extreme prostration, rapid pulse rate, and temperature ranging between 100° and 101° F. In other cases the temperature may rise to 104° or 105° F., all depending on the disturbance of the thermic center. It is in this class of cases that we welcome almost any remedy.

Convalescent Human Blood-serum.—The intramuscular injections of convalescent blood-serum, as a therapeutic agent, have been extensively used both in this country and abroad. It is especially indicated where septic conditions exist. I have seen cases of septic scarlet fever at the Willard Parker Hospital injected with 200 to 300 cubic centimeters of serum from cases in the fourth and fifth weeks of convalescence. Within twenty-four hours after the injection a rapid fall in temperature is noted. Sometimes the temperature falls by lysis. This therapeutic measure is sufficiently important to encourage its use whenever possible. Intravenous injections of 0.2 to 0.3 gram of neosalvarsan rendered very good results. Out of 12 hopeless cases injected, 7 recovered.

Since the introduction of neosalvarsan, the technic of preparation has been greatly simplified. The neosalvarsan is dissolved in sterile water, and is ready for injection.

For a young infant under 1 year, 0.1 gram of neosalvarsan is dissolved in 20 cubic centimeters of sterile water and injected into the longitudinal sinus. An older child, 2 to 4 years, may receive 0.2 gram of neosalvarsan in 40 cubic centimeters of sterile water. Owing to the small size of the median basili-

vein at the bend of the elbow, it may be necessary to incise the skin and expose the vein to insert the needle. My preference has been to inject into the jugular vein. The technic is simple if the neck is properly supported. No systemic effect is noticeable after the injections. By using the neosalvarsan we avoid the complicated preparation which was necessary in the use of salvarsan.

An illustration of the technic of injecting into the median basilic vein may be seen on page 639. The technic of injecting into the posterior longitudinal sinus may be seen in Plates LX, LXI, and LXII.

A series of cases of scarlet fever¹ in which profound toxemia existed were injected with neosalvarsan. In a case of severe noma complicating scarlet fever an injection of 0.2 gram of neosalvarsan was given with excellent results.

There is no specific drug or serum in use today so that too much should not be expected from neosalvarsan.

¹ Reported at the International Medical Congress, London, 1913. Section on Diseases of Children.

X.

VARICELLA (CHICKEN-POX).

VARICELLA is a specific infectious disease of an acute character. The eruption consists of vesicles, which appear in successive crops. The attack lasts in all from four to fourteen days. After one attack the child is usually immune during the rest of its life.

Etiology.—This disease is seen only in young children; the older the child, the less liable it is to have chicken-pox. Nurslings are frequently afflicted.

Hutchinson states that in his experience adults are almost absolutely immune from this disease. In my own practice the majority of cases seen by me have been in children between the second and tenth years of age.

Pathology.—The pathological lesions are confined wholly to the epidermis. The vesicles contain granular fibrin, a moderate cellular exudate, cellular *débris*, and serum; this differs markedly from the exudate in variola, which is usually very rich in cells, especially plasma cells. The pock in varicella is shallow, rarely involving the papillæ of the cutis, and as its contents are absorbed, the superficial covering is cast off in the form of a brownish scab, sometimes with marked pigmentation, but no resulting scar. The occurrence of a scar following the varicella lesion is occasionally seen.

Diagnosis.—The distinguishing features of varicella are: (a) Its mild prodromal symptoms, which may be wholly absent. (b) The appearance of the eruption on the trunk, where it is usually more abundant than on the face and hands. (c) The multiform character of the eruption, its superficial position, comparable to drops of water sprinkled over the skin, and its appearance on the same region in successive crops. (d) Its mild constitutional symptoms and short duration; the disease usually terminates within from five to fourteen days. (e) Varicella is mildly infectious and always gives rise to a like disease.

A nursing infant, about 5 months old, refused the breast, and seemed to show a general malaise. The infant had previously enjoyed good health. The nursing was regularly carried out and the bowels were normal. The temperature was 100° F. There was no cough. On the second day of this malaise several lesions appeared on the abdomen and back. Later, some

vesicles appeared on the buttocks, thighs, and in the roof of the mouth. There was no constitutional disturbance and on the third day of illness the infant again nursed as usual. Several successive crops appeared, and each eruption remained about three days. Local treatment consisted in dusting the parts with cornstarch. Bathing was prohibited and small doses of calomel were given. No complications followed.

Differential Diagnosis.—This disease may be confounded with variola, as some mild cases of variola resemble chicken-pox.

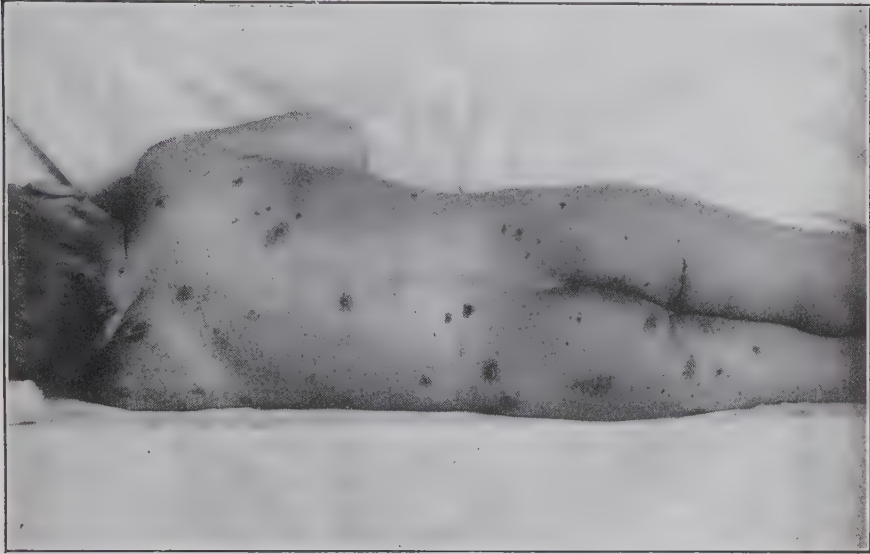


Fig. 185.—Pustules surrounded by an inflammatory areola. From the service of the Willard Parker Hospital. (*Howard Fox.*)

The superficial strata of the epidermis are principally involved, and a serous exudate, which is frequently the first symptom of the disease, occurs at this point, resulting in a transparent, thin-walled vesicle, while in variola the shot-like, deep-seated induration and subsequent vesicular formation are sufficiently distinctive to warrant a differential diagnosis. The lesions in varicella, as a consequence, are easily destroyed, and when seen present a transparent, beady appearance, some of which, having ruptured, leave excoriated areas; whereas in variola it is impossible to rupture the lesions so as to evacuate the entire contents without numerous punctures or by totally destroying the diseased area.

In variola we have more uniformity of development: First papules followed by pustules and ending in desiccation, leaving black crusts. In chicken-pox we find a *varying of lesions at the same time*, so that we may have *macules, vesicles, and pustules* at one and the same time. In variola the eruption is thickly seen on the face and hands, the exposed portions of the body. In chicken-pox the eruption is seen on the abdomen and back; the parts protected by clothing are usually first covered. When called to doubtful cases the following points are worth noting:

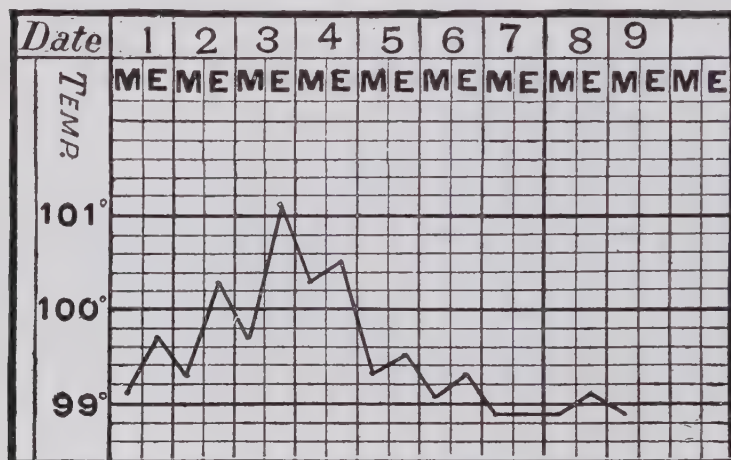


Fig. 186.—Temperature curve in varicella.

Umbilication is seen in smallpox; it is *absent* in chicken-pox. The length of time since vaccination, and whether or not the patient has ever had chicken-pox. Smallpox is extremely seldom encountered within three or four years after vaccination, while after that time the number of cases of varioloid or abortive smallpox steadily increase. Chicken-pox, like smallpox, occurs but once in the same individual. Prodromal symptoms are always present for several days, usually three, in variola; absent or of a few hours' duration in varicella.

The temperature often renders valuable aid in differentiating between the two diseases. In variola it rises rapidly, and even in mild or abortive cases usually reaches 103° to 104° F., when, on the appearance of the rash, a crisis takes place and it falls to the normal within a few hours, where it may remain throughout the remainder of the disease. Varicella, on the contrary, is sel-

PLATE LIV



CHICKEN-POX.

Elevated pustules filled with yellowish serum usually discrete,
are characteristic of this disease.

PLATE LV



Chicken-pox. Showing pustular and ulcerative form in the same case. This unusual form shows how infections can be carried by dirty fingers.

dom ushered in with fever, but the temperature usually rises one or more degrees as the eruption develops. When the case is seen for the first time after the eruption has appeared and, as often occurs, no definite history can be obtained, other symptoms must be relied upon.

Varicella may also resemble impetigo. Impetigo is first seen on the face, especially about the mouth and nose. It is also seen

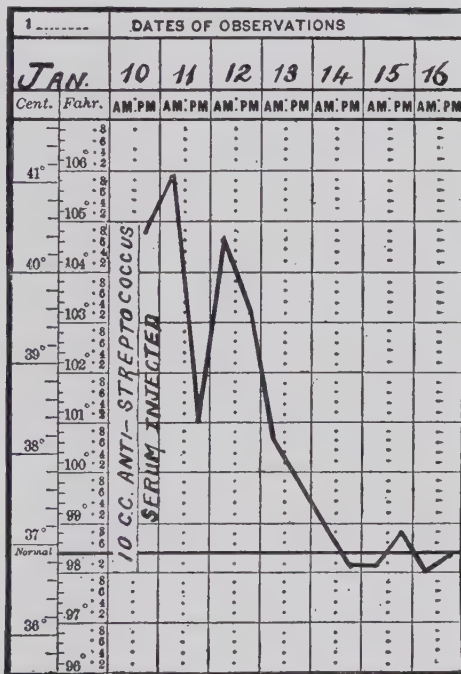


Fig. 187.—Erysipelas following varicella. Locally, pure alcohol in which 1:2000 bichloride mercury was dissolved was applied on the erysipelatous surface continually. Case recovered.

on the hands. In studying the regional appearance of the eruption one can readily see the transmission and inoculation from face to hands and *vice versa*. This condition is never met with in chicken-pox. Impetigo may last weeks and months. Chicken-pox rarely exists more than two weeks. Impetigo is contagious and not infectious. Chicken-pox has been successfully inoculated.

Prognosis.—The prognosis is invariably good. I have never heard of a fatal case of chicken-pox. Complications should, however, be guarded against and not invited by carelessness.

Treatment.—A child suffering with chicken-pox should be put to bed and strictly isolated. Healthy children should not come into contact with a case of chicken-pox for at least two weeks.

The diet should be liquid, and feeding should be given at regular intervals. The bowels should be loose, and if necessary stimulated by the aid of a laxative.

For the eruption flannels and woolens should be avoided, and a cool, loosely fitting linen or muslin shirt or gown should be worn. It is safe to prohibit the daily bath until the eruption has disappeared. I prefer to dust the skin with some bland dusting powder, such as talcum, cornstarch, or rice powder, several times a day. Iron and tonics may be given later if required. Locally, a paste made by mixing bicarbonate of soda with cold water and applied to the chicken-pox is cooling.

The hygienic supervision of the fingernails is very important. When the vesicles dry there is intense itching and a tendency to scratch. The fingers should be soaked with equal parts of peroxide and water at least twice daily during the convalescent period. By this means we can prevent infection.

Baby B., 5 months old, had a severe form of varicella with gastric disturbances, such as vomiting and diarrhea. On the sixth day after the appearance of the chicken-pox the infant scratched its arm. On the following day there was a temperature of 102° F. and a diffuse swelling surrounded the upper arm. There was marked tenderness and pain on the slightest motion. The swelling increased. The arm became reddened and a diffuse erysipelas was diagnosed. The temperature increased to 105.8° F.

Treatment.—Local treatment consisting of evaporating cooling lotions; lead and opium wash and bichloride were used without any marked benefit. An injection of 10 cubic centimeters of antistreptococcus serum seemed to have very good effect. The cooling lotions were continued, but within twenty-four hours after the serum injection the temperature came down by lysis and after four days the temperature was normal. The case recovered.

XI.

VARIOLA (SMALLPOX).

THIS acute infectious and contagious disease is frequently seen in unvaccinated children. It is rarely met with in children that have been properly vaccinated. I have seen smallpox in very young infants and children *that were unvaccinated during my service at the Riverside Hospital.*

Etiology.—The etiological factor, most likely a specific micro-organism, has not yet been found.

Among unvaccinated children between 1 and 10 years of age, some authors state that 58 per cent. die. During the Sheffield epidemic, of 2892 unvaccinated children under 10 years of age living in infected houses, 7.8 per cent. were attacked. During the Warrington epidemic 54.5 per cent. of unvaccinated children under 10 years of age were attacked.

It is a curious fact that the resistance of children is less than that of adults. Nursing infants frequently have mouth, nose, and throat complications, which seriously interfere with their feeding, causing death.

There are three types of variola:—

TABLE No. 58.

| | | |
|----------------|------------------|---|
| 1. Natural | { Discrete | { Discrete when the eruption is scattered. |
| | { Confluent | { Confluent when the eruption is thick and flows together. |
| | { Semi-confluent | { Semi-confluent when the eruption is discrete in some parts and confluent in others. |
| 2. Hemorrhagic | { Purpuric | |
| | { Hemorrhagic | |
| | { Exudative | |
| 3. Modified | { Anomalous | { Corymbose when the eruption forms groups or clusters on various parts of the body. |
| | { Corymbose | |

The mode of infection is most probably a micro-organism which exists either in the vesicles, pustules, or crusts. It may be carried in the air so that infection may take place at some distance from the body. Some authors believe that the blood of smallpox patients contains the poison. Smallpox can be transmitted directly from person to person. It can also be transmitted from bedding



Fig. 188.—Two children in the Municipal Hospital of Philadelphia, one unvaccinated, and the other vaccinated on day of admission; the crust still visible on the leg. This child remained in the hospital, with its mother who was suffering from smallpox, for three weeks, and was discharged perfectly well. The unvaccinated child, admitted with smallpox, died. (From "Acute Contagious Diseases," *Welch and Schamberg*.)

or clothing worn by an infected person. *Entering a room* during the pustular and desquamative stages is sufficient to communicate the disease.

Symptoms.—In young children the disease is usually ushered in with convulsions. The pulse-rate ranges between 130 and 160. The respiration is labored and increased in frequency.

Curschmann believes that these symptoms are due to an irritation of the respiratory centers.

The *temperature* rises rapidly and continuously *without* the morning remission. Beginning with 102° or 103° F. on the first day of illness, the temperature soon reaches 105° F. until the eruption appears.

With the first appearance of the eruption, the temperature frequently drops to normal. *This symptom of fever occurs in no other exanthematous eruption.*

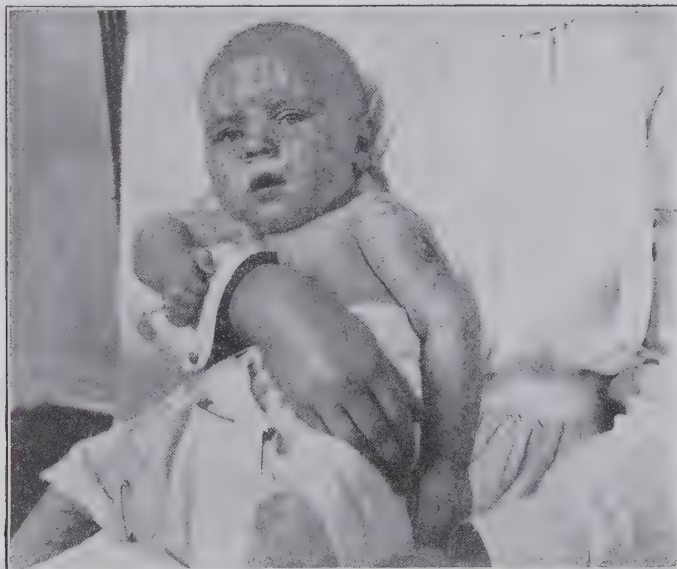


Fig. 189.—Smallpox in a child that was vaccinated during the incubation period. Vaccination performed five days before the appearance of the variolous eruption. Little or no modification. (*J. F. Schamberg.*)

The Eruption.—Reddish specks or dots developing into papules resembling flea-bites appear about the second day. After the papules have attained the size of a small pea their summits gradually assume a translucent glazed appearance which indicates the formation of a vesicle. As this enlarges a central depression or umbilication takes place which is looked upon as characteristic of the smallpox lesion. If punctured a small amount of mucilaginous serum exudes. The eruption is not confined to the skin, but is met with in the mucous membrane on the mouth, throat, and nose.

Stage of Suppuration.—On the sixth day of the eruption there is a decided yellowish tint, due to the presence of pus cells or polymorphonuclear leucocytes resembling cream. The face usually presents an erysipelatous redness.

Stage of Decline.—About the twelfth day of the eruption there is a spontaneous rupture of the pustules. After the contents are thus evacuated, or by absorption, we see *evidences of desiccation*.

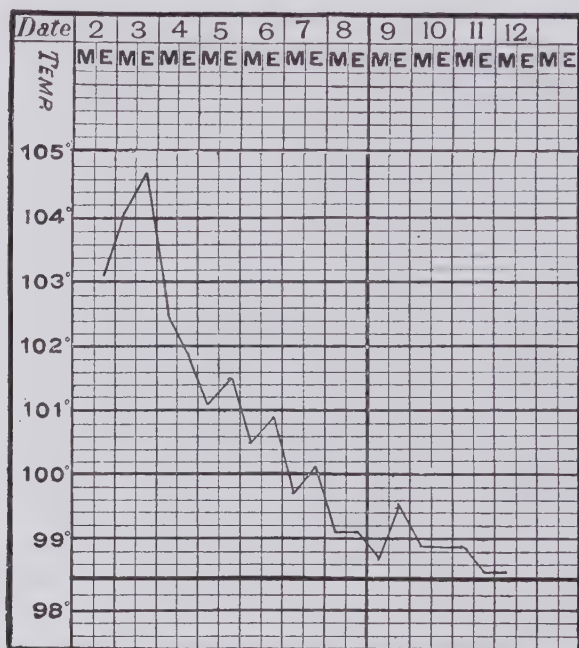


Fig. 190.—Temperature curve in variola.

The pustular contents dry up and the pustule dies, leaving a blackish crust. These blackish or brownish crusts appear first where the eruption took place. We therefore first note this condition on the arms, palms, and soles. The crusts separate from the body between the sixteenth and twenty-first days.

Desquamation of a furfuraceous character takes place, lasting from one to two weeks. After this condition has disappeared the patient may be regarded as cured.

Differential Diagnosis.—Corlett describes the great resemblance of smallpox to typhoid fever in its early stages, in a case



Fig. 191.—Smallpox in an unvaccinated child. Note absence of lesions on the trunk. Vaccination with cow-pox would have prevented the above. (*Schamberg.*)

seen by him. A strong Widal reaction was found, besides a bronchitis.

Measles frequently resembles smallpox. Catarrhal symptoms always present in measles are absent in smallpox. The lesions in measles are flat, soft, and velvety to the touch. The papules of smallpox are small and feel like shot imbedded in the skin.

Scarlet fever sometimes resembles variola of a mild form. The premonitory symptoms of variola are very severe, and last two or three days, whereas those of scarlet fever are mild, last a few hours, and not infrequently are entirely overlooked. The rash in scarlet fever appears on the upper part of the body, chest, cheeks, and neck. In variola a scarlatinal form of eruption is seen on the lower part of the abdomen and on the inner surface of the thighs. It is bright and fiery red in scarlet fever and dull red in variola. The conspicuous papillæ or strawberry tongue is present in scarlet fever and absent in smallpox.

Impetigo is frequently mistaken for smallpox. Corlett describes the presence of supposed impetigo in Ohio in 1898 which gave rise later on to an epidemic of smallpox. Thus it is apparent that there is a great resemblance between impetigo and smallpox, and *vice versa*.

Chicken-pox is frequently mistaken for smallpox. I have already outlined the differential points in describing chicken-pox (see chapter on Varicella).

Syphilis may sometimes be mistaken for variola. A study of the temperature and pulse and careful observation for several days will usually clear up the diagnosis. In variola the eruption assumes a pustular character on the palms and soles.

The **prognosis and course** are always bad in unvaccinated children, especially in the very young. In the vaccinated the prognosis is always good.

As a rule the course extends over three weeks, rarely lasting four weeks. Complications of the nose, mouth, and throat of a catarrhal nature are occasionally seen. The outcome of the cases seen by me was quite good in spite of the severe character of the disease.

Complications.—Swelling of the mucous membrane, such as edema of the glottis, bronchitis, and bronchopneumonia, frequently complicates variola. The eruption plus secretion, when present in the throat, are the cause of great irritation, and give rise to a hacking cough. Suffocatory symptoms may follow

PLATE LVI



Confluent type of smallpox. Seventh day of vaccination. Vaccinated too late—during incubation period. (*Schamberg.*)

edema of the glottis. Otitis of a purulent nature is frequently seen. It is usually accompanied by severe neuralgic pains.

Treatment.—The best sanitary surroundings, fresh air, and the strictest possible isolation are advisable. The local application of a solution of glycerine and carbolic acid will tend to relieve the itching, and to soften the crusts.

The bowels should be kept thoroughly cleansed, and the patient made comfortable by a tepid pack if the temperature is high or if delirium is present. An ice-cap and cold colon flushing will render the patient more comfortable. If cardiac depression exists, stimulation with musk or digitalis is advisable. Regarding sanitary measures the New York Health Department requires the immediate removal of a case of this kind to the smallpox hospital. The disinfection and thorough fumigation of everything which was in contact with the case must be remembered if we wish to prevent the spread of the disease.

VARIOLOID (MODIFIED SMALLPOX).

The symptoms are milder, the papules less in number, and the general condition shows an infection of a lesser type than we see in variola. The febrile symptoms may be the same as we see in true smallpox. The attack is shorter. The severity of the symptoms depends on the length of time since the last vaccination took place.

VACCINATION.

The greatest triumph of medicine dates back to the last century when Jenner inoculated the virus from a cow's udder and produced vaccinia in human beings. This virus is a protective agent against smallpox.

The immunity conveyed by a successful inoculation of cowpox lasts about five years. Vaccination should be repeated at least once every five years during the school period.

Symptoms.—From five to ten days after inoculation a red areola is seen around the wound. Inflammatory symptoms are marked. The neighboring lymph glands are swollen. An eruption resembling measles or scarlet fever sometimes follows vaccination.

It usually involves the arms, neck, and chest; in rare cases it involves the whole body. It most commonly occurs between the eighth and eleventh days after vaccination. The temperature is rarely above normal and there is no constitutional disturbance.

Complications.—Rare complications are erysipelas and cellulitis. Abscesses are usually the result of carelessness or infection. This infection usually takes place at the time of inoculation or may result from dirt or scratching with dirty nails, or other filthy habits. (Read chapter on Varicella.)

Syphilis and tuberculosis are mentioned as accidental infections, but I have never seen or heard of a *bona fide* case resulting from vaccination.

During my service at the Riverside Hospital in the smallpox wards, I have seen twenty-four infants, all under one year, most of them breast-fed, suffering with smallpox. Not one of these infants had been vaccinated. An interesting picture of a vaccinated and an unvaccinated infant, the one immune, the other suffering with smallpox is shown on page 746.

Welch and Schamberg¹ in a series of cases call particular attention to the great difference in the death-rate between the vaccinated and the unvaccinated patients. Those who were vaccinated in infancy and showed good scars gave the remarkably low death-rate of 2.61 per cent. as against the high death-rate of 28.17 per cent. in the unvaccinated. There is no doubt that all those who showed either good or fair scars were successfully vaccinated. If we consider them together the death-rate is 4.84 per cent.

In making a comparison between the vaccinated and unvaccinated cases, it is scarcely fair to include as vaccinated, all the cases showing poor scars, as very many of them, doubtless, were never successfully vaccinated.

Patients who had been vaccinated seven days, or less than seven days, before the appearance of the eruption of smallpox gave a death-rate of 35.71 per cent., while those who had been vaccinated for a longer period than seven days before the outbreak of the efflorescence gave a death-rate of only 14.28 per cent.

When to Vaccinate.—The safest plan is to vaccinate an infant during its first year. I frequently vaccinate infants three months of age, but advise, especially those living in the large cities, to be vaccinated no later than the ninth month.

Where to Inoculate.—Usually on the arm, although the leg is sometimes preferred for females. The upper third of the arm is the part usually chosen. When preference is shown for vaccina-

¹ WELCH and SCHAMBERG: Therapeutic Gazette, June 15, 1902.

tion on the leg, a spot several inches above or below the knee-joint, on the posterior surface, is usually chosen.

Asepsis must be strictly carried out. There is always danger of infection by scratching or from soiled linen. The skin should be thoroughly cleansed with soap and warm water and dried with cotton. Through a capillary tube blow or express, by means of a rubber bulb, a small drop of vaccine, and with a sharp pointed needle scarify the cuticle under the droplet of vaccine. After this area has dried a piece of sterile cheesecloth is applied, to protect against friction of the clothing. Do not use heavy shields. When cheesecloth is applied it should be changed at least every two days.

Treatment.—Cleanliness and avoidance of scratching is all that is necessary until the vaccination is terminated. Intense itching can be allayed by spirits of camphor washed over the surface several times a day, or by applying a piece of gauze saturated with lead water.

If an infection has taken place, then gauze saturated with anti-streptococcus serum directly over the vaccinated area is beneficial. During my service at the Willard Parker Hospital the House Staff used this method with excellent result.¹ To avoid evaporation and retain the moisture of the serum the gauze should be covered with oiled silk.

The daily bath may be given as usual. As the vaccine is absorbed the bath does not interfere with the action of the same. A fresh sterilized gauze dressing must be applied after the bath.

VACCINIA.

This acute condition is characterized by an eruption following the inoculation of lymph. When lymph is taken from an eruption on the teat or udder of a cow, it is called vaccine. Some authors believe that vaccinia is a modified form of smallpox.

Symptoms.—An eruption resembling measles or scarlet fever sometimes follows vaccination. It usually involves the arms, neck, and chest; in rare cases it involves the whole body. It most commonly occurs between the eighth and eleventh days after vaccination. The temperature is rarely above normal and there is no constitutional disturbance. There is no treatment excepting cleanliness. Internally, a mild laxative may be given.

¹ SEXTON: Archives of Pediatrics, Feb., 1913.

XII.

TYPHOID FEVER.

PARATYPHOID.

PARATYPHOID resembles typhoid fever and can only be differentiated by bacteriological examination. There are two organisms known as paratyphoid A and paratyphoid B. The paratyphoid B is much more common than paratyphoid A.

At times a differential diagnosis between paratyphoid and typhoid is almost impossible.

TYPHOID FEVER.

Typhoid Fever is an acute infectious disease caused by the invasion of a specific micro-organism, known as Eberth's bacillus.

Fetal Typhoid.—If a pregnant woman develops typhoid, the infant *in utero* may develop the disease, although all cases do not develop the disease.

In the fetus the disease is a general blood infection, since the intestines are not functionally active. The most common result is death of the fetus and consequent abortion. The infant may be born alive suffering from the infection. Death usually occurs. (Holt.)

It may be born alive but feeble and suffering from the infection. If so, death occurs in a few days without definite symptoms. It is possible that the fetus may pass through the infection *in utero* and be born alive and well. There is, however, no proof that this happens. Infection does not always occur. The pregnant woman does not necessarily transmit the disease to her child.

The serum reaction occurs in infantile as in adult typhoid. There are no data as to whether or not it occurs in fetal typhoid.

In a series of cases described by Hensch:—

- 2 cases occurred during the 1st year.
- 21 cases between the 2d and 5th years.
- 59 cases between the 5th and 10th years.

Von Steffens in a series of 148 cases reports:—

- 2 cases occurred during the 1st year.
- 28 cases between the 3d and 6th years.
- 34 cases between the 6th and 9th years.

I have seen typhoid fever in an infant 1 year old which was infected by its mother.

Etiology.—Typhoid is rarely seen in infants. It is most frequently seen in children over five years of age. Although I have met typhoid in an infant one year of age, most of my cases have occurred in children over ten years of age. In a study of 25 cases of typhoid met in the wards of the Sydenham Hospital of New York City:—

- 5 cases occurred under 3 years of age.
- 6 cases between the 3d and 6th years.
- 12 cases between the 6th and 10th years.

Infected water and infected milk appear to have caused this disease more than any other factor. The eating of raw vegetables, especially when sewage or contaminated water have come in contact with them, has caused this disease. Baginsky mentions flies as an occasional source of infection.

The New York Health Department, in a circular of information concerning the urine in typhoid fever, directs attention to the fact that the typhoid bacilli are present in almost incredible numbers, estimated at many millions per cubic centimeter.

These germs find a suitable culture medium for their propagation in the intestinal tract. They are very easily found in the feces in the living state during the height of the disease.

The entrance of the typhoid bacillus into the gastrointestinal tract, whether it is in food, liquid or solid, is responsible for the disease. It is true that a receptive condition may exist. A child that has had a series of gastrointestinal attacks is more liable to an infection than one whose digestive tract is normal. Rickets and a general debilitated condition certainly favor the development of typhoid.

Typhoid fever occurs most frequently in the fall of the year. I have seen more cases of typhoid in children during September and October than during the rest of the year. During the fall and winter months some of the worst cases of typhoid with hemorrhages occurred.

Transmission of Typhoid from Mother to Infant through Infected Discharges.—A mother about 35 years of age became ill with typhoid fever—toxic—nursed her infant until the diagnosis of typhoid was made. The infant was 1 year old and slept with its mother. When the diagnosis of typhoid was made the infant was weaned. Sanitary conditions were poor. One week after wean-

ing, vomiting, diarrhea and fever suddenly developed in the infant. On the ninth day the blood gave a positive Widal reaction. The fever continued in all fifteen days and the infant recovered. The mother died of hemorrhage during the third week of her illness.

Bacteriology.—The typhoid bacillus resembles the *Bacillus coli communis*, and is found chiefly in the lymphoid tissue of the small intestines, especially in Peyer's patches, where it produces a specific inflammation. The bacillus is found not only within the intestines, but in the glands as well. Neuhaus found the bacillus by puncturing the roseolar eruption and examining the blood therein. It has also been found in laryngeal ulcerations during typhoid. The bacillus was also found in the purulent meningitis accompanying typhoid, so that we can be reasonably certain that the bacillus abounds in almost every part of the body. The action of the typhoid bacillus on the human system is toxic. Brieger isolated a poison from the typhoid bacillus, which is called the typho-toxin.

Pathology.—The pathological findings consist in an inflammatory condition of the mesenteric glands; besides these the solitary and agminated glands of the ileum and colon not only show evidences of swelling, but when the disease progresses it frequently terminates in ulceration and necrosis.

Occasionally the glands will show a softening and pus will develop. The spleen is usually very large and soft, and quite palpable. When the disease lasts several weeks and there are evidences of a distinct toxemia, the poison will cause a marked degeneration of the kidneys and liver, also affecting the heart muscles, which, later, will be found very soft and flabby.

Immunity.—The agglutinating power may or may not be present in the blood of infants born of a woman with typhoid. If present, it is transmitted from the mother to the child through the placenta. It is possible, however, that it may be formed in the child in response to toxins transmitted through the placenta. The agglutinating principle can pass through the normal placenta. Part of it, however, is arrested in the passage. Whether or not it is transmitted seems to depend on the strength of the agglutinating power in the maternal blood and the length of time during which the placenta is exposed to it.

It may be transmitted to the nursling through the milk. It may appear in the infant's blood in less than twenty-four hours.

It lasts but a few days after the cessation of nursing. It is always weaker in the milk than in the maternal blood and always weaker in the infant's blood than in the milk. This weakening of the agglutinating power is due to the obstruction to its passage in the mammary gland and in the nursling's digestive tract. The chief factor governing transmission is the intensity of the power in the maternal blood. A subordinate but important factor is some unknown condition in the digestive tract. If the power in the maternal blood is weak and the obstacles great it may not be transmitted.

Symptoms.—The symptoms are usually very obscure in children. Vomiting and sometimes diarrhea are the earliest symptoms. In other cases constipation may be an early symptom. The so-called pea-soup diarrhea seen in adults and older children is rarely met with in young infants. Convulsions frequently usher in an attack of typhoid fever.

In older children, those able to complain will usually give subjective symptoms, which may aid materially in making the diagnosis. A constant headache, for example, will always show a severe form of infection, and may be the only symptom which will be constant.

The period of incubation varies from five to fourteen days. Rarely the period of incubation extends over three weeks.

The Temperature.—When this disease begins with a severe infection there is a sudden onset of all symptoms, and the temperature will rise to 103°, 104° or 105° F. during the first week of the illness. When there is a milder infection the temperature may not rise above 102° F. The usual step-ladder type of fever in which the temperature rises 1 degree more each day until 104° or 105° F. is reached is not frequently met with. In the usual type met with during infancy and childhood, the temperature ranges between 101° and 102° F. in the morning, reaching 102° or 104° F. in the evening and continues during the first and second weeks with remissions of two degrees daily. At the end of the second, or sometimes the third week, the temperature gradually falls and may reach the normal at the end of twenty-one, twenty-eight, or thirty-five days. The temperature drops by lysis, never by crisis.

Secondary fever is rare in children. It is not unusual to find a mild form of typhoid terminating normally at the end of two weeks.

During the second week of the disease when the temperature remains fairly constant, the diagnosis will be much easier, although a positive diagnosis from the temperature alone should not be made. The temperature in a mild form of typhoid in an infant varies between 101° and 103° F. during the first week, or even the second week, of the disease. Toxic cases may show a temperature of 105° F., or even higher, during the first week of the illness. The temperature may show peculiar variations. We may have a sudden rise extending over a period of six weeks instead of three weeks. This prolonged pyrexia sometimes denotes complications. If the temperature has ranged between 103°, 104°, or 105° F., and suddenly drops to normal or subnormal, then we must suspect either an internal hemorrhage or look for a perforation. Such variations in the temperature, as a very sudden rise or fall, must always be looked upon with suspicion. There is no crisis in typhoid as there is in pneumonia.

The Pulse and Respiration.—The pulse is usually increased in frequency and ranges between 130 and 160 per minute. The force and rhythm are good unless some complication arises. The pulse is usually small and compressible, and there is very low tension in fatal forms of the disease.

The respiration is irregular, at times increased in frequency so that a suspicion of pneumonia may exist.

The Eruption.—The eruption consists of lenticular-shaped, rose-colored spots. They are small and slightly elevated. These rose-colored spots appear at the beginning of the second week. The eruption lasts about ten days, although the spots last from two to three days and are succeeded by a new crop. They are seen on the thorax and abdomen, although at times over the whole body.

Coughs and Bronchial Catarrh.—One of the earliest symptoms in typhoid is bronchitis. In the early stage when we have but cough and fever the diagnosis will be quite difficult. Typhoid frequently simulates pneumonia.

The Nervous System.—Convulsions are frequently present, especially where profound toxicity exists. Spasmodic contractions of the sternocleidomastoid may appear.

Extreme Emaciation.—Emaciation usually results from prolonged fever and the inability to assimilate the normal quantity of food. Prolonged diarrhea drains the system and results in loss of weight.

The Tongue.—The tongue is coated with a whitish, more rarely a brownish, fur. This coating extends down the center, although the whole tongue may be covered. The mouth appears very dry, and the patient sometimes complains of intense thirst.

The abdomen is usually distended with gas and there is marked tympanites on percussion. Gurgling and tenderness on palpation in the ileocecal region is not to be looked upon as an important symptom.

The Spleen.—The spleen cannot be relied upon as a diagnostic aid in children. While it may be enlarged in some instances, we frequently find that it is not palpable in many cases of severe typhoid.

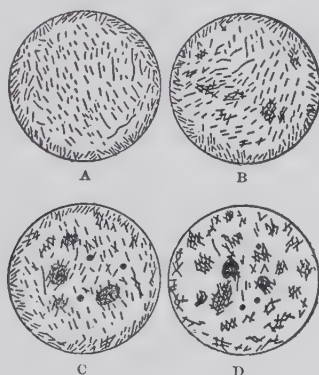


Fig. 192.—Stages in Widal reaction. (After Robin.)

Diagnosis.—There are several important aids to the diagnosis. First, the blood should be examined to determine the presence or absence of a leucopenia.¹ In typhoid the leucocytes are always decreased, therefore, a leucocyte count below 6000 means typhoid. If meningeal symptoms are present and the leucocyte count is above 9000 or 10,000, then the diagnosis of meningitis is justifiable. A lumbar puncture should always be made to determine the presence of organisms such as a diplococcus in cerebrospinal meningitis or the tubercle bacillus in tuberculous meningitis.

Stools and urine as well as the blood contain typhoid bacilli in the early stages of the disease. If typhoid fever is suspected one or all of these should be examined for the presence of the

¹ FISCHER, LOUIS: Observations in Infantile Typhoid. International Clinics, vol. iv, 1909.

organism. The Widal reaction is not present until ten days or two weeks after the symptoms appear, so that it is a valuable confirmatory test if it does not aid in establishing an early diagnosis. This reaction is always a trustworthy evidence of the presence of typhoid, and a negative reaction later than the tenth day is strong but not absolutely convincing evidence of the absence of typhoid. The test is of greater value in the case of an infant than an adult, as we can exclude the occurrence of a previous attack. Some writers state that the reaction is seen earlier in children than in adults.

It should not, however, be the only means of making a diagnosis. It is well known that this reaction will occur months and sometimes years after the patient has recovered from typhoid, hence great caution should be used in relying on this diagnostic measure exclusively.

The results of a very large number of examinations made in New York and elsewhere show, that if the blood contains agglutinating substances in sufficient amount to cause a prompt and marked reaction, when 1 part of serum or blood solution is added to 10 parts of a broth culture of the typhoid bacillus, the presence of a previous or existing typhoid infection may be considered as extremely probable, and that if these substances are present in such an amount as promptly to produce the reaction, when 1 part of serum or dried blood solution is added to 20 parts of the culture, the presence of a previous or existing typhoid infection may, for diagnostic purposes, be practically considered as established.

Directions for Preparing Specimens of Blood.—The skin covering the tip of the finger is thoroughly cleansed and then pricked with a clean needle deeply enough to cause several drops of blood to exude. Two large drops are then placed on the glass slide, one near either end, and allowed to dry without being spread out on the surface of the slide. After they have dried, the slide is placed in the holder and returned in the addressed envelope to a culture station, or mailed to the laboratory.

The diazo reaction should be looked upon as a valuable aid in making the diagnosis. It is described in detail in the chapter on Urine.

Differential Diagnosis.—The frequency with which meningitis is met in children and the great resemblance of the symptoms in the early stages of typhoid and meningitis will render the

diagnosis difficult at times. On the other hand, in cerebrospinal meningitis we have the characteristic diplococcus present. In tuberculous meningitis there will be found the tubercle bacillus. The reduction test (Fehling's) for sugar is absent in typhoid.

The two most important aids in the diagnosis of typhoid are the Widal reaction, which if positive means typhoid, and the white cell count. If the leucocytes are very low, as I have previously described, between 4000, 5000 or 6000, a leucopenia exists and the diagnosis of typhoid is justified. Malaria frequently resembles typhoid. A differential diagnosis can easily be made by the examination of a blood smear for the presence of plasmodia.

The administration of quinine is a diagnostic test of practical importance. *An irregular or intermittent fever which yields promptly to quinine is certainly not typhoid.* In malaria, the temperature will be found to touch normal at some time in the twenty-four hours.

Cholera Infantum.—Many cases of supposed cholera infantum frequently prove to be typhoid fever. I have seen cases in mid-summer with a temperature of 102°F., having roseola, with vomiting and diarrhea. In such cases the diagnosis depends on the presence of the Widal reaction.

When diarrheal symptoms and fever are present in the early stages of typhoid fever it is extremely difficult to make a diagnosis. This applies especially to the first week of the disease before a Widal reaction can be made.

The Urine.—The urine should be examined for the presence of the Diazo reaction.¹ If the reaction is present it strongly supports the diagnosis of typhoid.

A positive indican reaction is present during intestinal toxemia and where stagnation of feces exists. Indicanuria usually excludes typhoid.

Internal Hemorrhages.—Holt reports a series of 946 collected cases in which hemorrhage occurred in 30 cases, about 3 per cent. The majority of these cases were over 10 years of age. I have frequently seen hemorrhages in children between 5 and 10 years; never under 5 years.

CASE I.—A case of typhoid in a boy 16 years old, seen in consultation, had a series of hemorrhages which ended fatally. The origin of this case was supposed to be an infection from eating raw oysters. The boy, a telegraph

¹ See chapter on Examination of Urine, page 1069.

messenger, ate some oysters in the street, after which he showed signs of fever, and intestinal symptoms. No other etiological factor was ascertained. The boy was in good health and suddenly became ill after eating this meal of oysters. Symptoms of gastric fever, with diarrhea; temperature of 101° to 103° F; gradually appeared. The symptoms increased from day to day until delirium and general coma were present. The fever was difficult to control in spite of cold tub bathing. The boy weakened from constant pyrexia—appeared to convalesce—when a severe hemorrhage occurred. An ice-bag was laid over the abdomen, and opium given internally. The colon was flushed with alum and water. Nothing seemed to control the bleeding.

CASE II.—A girl, 10 years old, was seen in consultation. She had been sick about three weeks. She was apparently convalescing when she had a hemorrhage of a very alarming nature. The doctor told me the child lost more than one pint of blood. The pulse was about 130 and very feeble in character. The child was deadly pale and seemed to be in collapse. Whisky and strychnine were ordered as restoratives. The child complained of chills and was thoroughly wrapped in warm blankets and hot-water bottles were applied to her feet. A teaspoonful of powdered alum added to a pint of cold water was injected into the rectum and colon. Paregoric in 15 drop doses was ordered every hour. The nurse was instructed to watch the pupils and the pulse and to discontinue the drug as soon as the systemic effect of the paregoric was manifested.

Intestinal Perforation.—Intestinal perforation is rare. It is met with in about 1 per cent. of all cases. A sudden fall in the temperature with collapse, rarely vomiting, followed by tympanites, are symptoms indicating perforation.

Laparotomy When Perforation Occurs.—The skill of the surgeon will frequently save life when hemorrhages occur. In a case of typhoid which progresses favorably during the third and fourth week, a sudden collapse should be an indication for an immediate operation. I have seen death follow a case of this kind in which operation was postponed. These cases are usually hopeless and our only chance consists in resorting to an immediate operation.

Complications.—*Aphasia* is occasionally met with. Morse reported 21 cases. *Insanity* is rarely met with as a sequel to typhoid. *Chorea* is frequently seen. I have met with a case having a severe form of choreiform movements which lasted more than a year, following the attack of typhoid.

Otitis media is frequently met with in children. It is very important to watch the ears during an attack of typhoid.

Less frequent complications are gangrenous inflammation of the mouth or genitals, pericarditis, endocarditis, peritonitis, pyemia, abscesses, and furuncles. Abscess of the liver has been reported

by Bokai. Pulmonary tuberculosis has been known to follow typhoid.

Prognosis and Course.—The prognosis is more favorable in children than in adults. Tympanites, if accompanied by vomiting, is a bad sign. When there is general depression and nervous

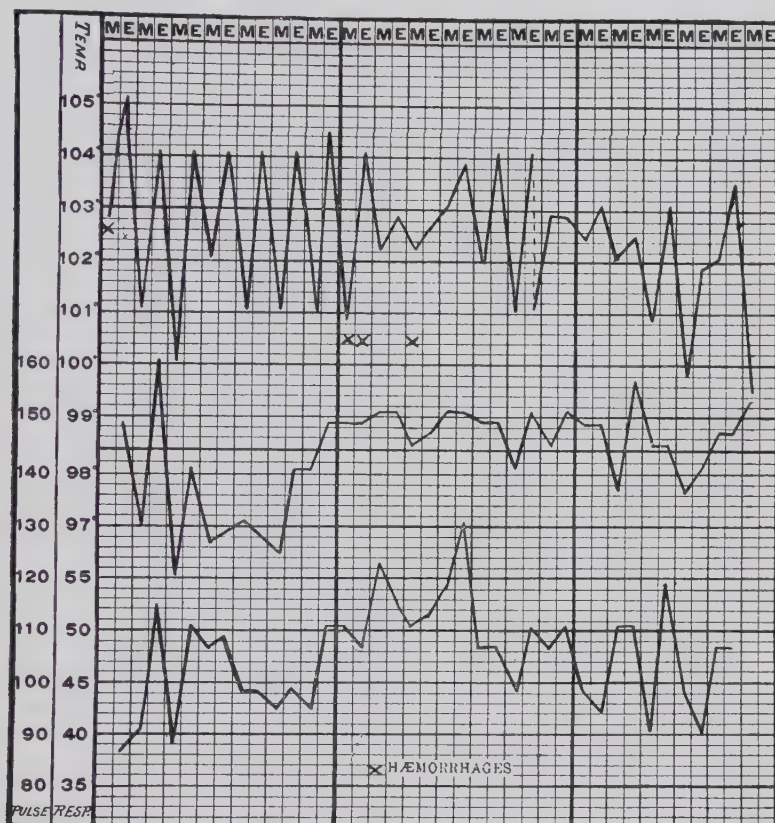


Fig. 193.—Typhoid fever. Severe hemorrhages. Fatal result.

symptoms then the prognosis is bad. Singultus is usually a bad sign. Bleeding should always be looked upon, especially if repeated, as a bad sign. The strength of the child, its assimilation of food, and the condition of the heart should be the means of arriving at the proper prognosis. Complications should always be regarded as a serious matter. The prognosis is grave if the child has passed through typhoid and is in an exhausted condition, and unable to cope with a new complication. Baginsky

states that in a series of 68 cases treated by him in the hospital, 6 died, a mortality of 8.8 per cent.

In children typhoid may terminate in two weeks. It may extend over three weeks or even four weeks. Mild cases of typhoid resemble an attack of acute gastric fever. Cases are occasionally seen in which the disease terminates abruptly within ten days. As a rule older children show the adult type of fever and the disease runs its course of three, four, or six weeks. Infantile typhoid may show severe gastric symptoms, such as vomiting, and very little diarrhea. The course, therefore, is peculiar to infants and entirely different from that seen in the older child.

V. L., 10 years of age was recently seen by me. She complained of headache, pain in the ear, and general malaise. Diagnosis: grippe. Later cough and fever developed. Her leucocyte count was 8000. Five days later it was 4200. The Widal reaction showed a partial agglutination. Tongue dry, with brownish coating. There was distention of the abdomen, tympanites, and an incontinence of stool. When seen by me she was in a semicomatose condition with marked delirium. A few roseola were scattered on the abdomen and chest. The temperature ranged between 105° F. in the evening and 102° F. in the morning. Diagnosis: Typhoid. Examination of the blood showed a paratyphoid B. infection. Two days later the leucocytes were 2200. The urine contained hyaline casts, pus casts and albumin. The pulse ranged between 104 and 116, respiration between 38 and 48. A few râles were heard at the base of the left lung. There was no evidence of consolidation. The child passed a large round worm. Daily doses of castor oil with salol were given. Owing to the leucopenia, 10 cubic centimeters of leucocytic extract was injected. Decided improvement followed this injection so that a second injection of the same dosage was then ordered.

Protein milk, fermented milk, egg yolk, and water in large quantities were given.

The prognosis owing to the extreme toxicity was bad, but the child recovered.

Prophylaxis.—When children are sent to a camp in the country, or to any outing camp where the source of the water supply is unknown, it is advisable to protect them with a prophylactic dose of typhoid vaccine. U. S. Army vaccine is given in one dose. The shock is too great to be borne by a child, hence, gradual immunity by giving three injections at seven to ten day intervals is preferable.

Vaccine.—An injection of 25,000,000 typhoid bacilli may be given to a child, and repeated in one week, unless a severe reaction is noted. If fever occurs, wait ten days to two weeks before giving the second injection. A third injection of 50,000,000 bacteria

should be given ten days after the reaction following the second injection has subsided.

Children can be protected by the injection of paratyphoid vaccine in doses similar to typhoid vaccine. Immunity can be conveyed for about one year by such injection.

Treatment.—*Fever:* The best antipyretic is the cold bath and cold pack. The bath must be properly given to be effective. A large bath-tub should be procured, large enough to hold the child at full length. This should be half-filled with water at a temperature of 90° F. Cold water or, in summer, ice should be added until the temperature is gradually reduced to 70° F. This is an agreeable method, as we avoid the shock so dreaded by children when suddenly immersed in cold water. The duration of the bath should be from three to five minutes.

The temperature of the child should be taken before and after the bath. The child's body should be rubbed continuously while in the bath so as to stimulate the circulation, especially so when the water is cool. If the child's pulse is feeble, administer a stimulant such as hot coffee or whiskey before the bath. Watch the pulse carefully, and if the slightest sign of weakness is noted, remove the child immediately from the bath and place in bed with hot-water bottles to its feet. The bath should be repeated every three or four hours or oftener, if the temperature requires it. If the temperature is not modified lower the temperature of the bath.

All antipyretic drugs such as phenacetin, antipyrine or guaiacol carbonate, if prescribed, should be given in small doses. Beginning with 1 grain every three hours the dose may be gradually increased until 3 grains are given at each dose. It is well to remember that all antipyretic drugs are cardiac depressants, hence, the pulse should be carefully noted and stimulation ordered if pulse weakness exists.

To cleanse the intestinal tract several teaspoonfuls of castor oil to which 1 or 2 grains of salol is added will also disinfect the intestinal tract. This salol-castor oil may be given every morning, with marked benefit to the patient.

When the leucocyte count is low the injection of 10 cubic centimeters of Squibb's extract of leucocyte is advised for a child of ten years or older. In younger children below five years, one-half the dose, or 5 cubic centimeters should be injected, and repeated daily until the leucocyte count increases.

Even though the intestinal canal is inflamed there is no objection to using a soft flexible catheter. Such mechanical treatment should be done by physician or nurse. When, however, any objection to the use of the catheter exists a low irrigation may be given while the foot of the bed is elevated.

We can cleanse the colon and remove accumulations such as stagnate in the colon. Cleansing instillations with borax water aid in the expulsion of flatus, are very soothing to the patient, and have a marked antipyretic effect. Such warm alkaline injections stimulate diuresis and aid in eliminating toxins through the kidneys.

If delirium is present—besides the tub bath previously mentioned, an ice cap should be applied to the head. If the child is very restless 5 to 10 grains of bromide of sodium should be ordered. It may be repeated in one hour. Veronal in 2 or 3 grain doses may be given with warm milk or broth to relieve insomnia. Luminal in 1 grain doses is a good sedative. Two doses may be given within two hours. To relieve flatulence and foul discharges I have previously mentioned salol with castor oil. Another excellent remedy is 2 grains of guaiacol carbonate repeated every three hours. Bismuth is not very useful owing to its constipating effect. It is more valuable when bloody discharges occur.

When there is considerable blood in the stools give tannalbin or tannigen, in doses of 5 to 15 grains every two hours. If the hemorrhage is very severe, then an injection containing 30 drops of Monsell's solution added to a quart of cool water, or a teaspoonful of alum, may be added to a pint of water. These injections can be repeated every three or four hours until the hemorrhage ceases. Or:

| | |
|---------------------------------|----------|
| R Thromboplastin solution | 1 ounce |
| Tepid water (90°) | 4 ounces |

Instil slowly into the rectum. To be repeated daily until hemorrhage ceases.

Ice-bags should be kept continually on the abdomen at the slightest sign of hemorrhage.

Hygienic Treatment.—No case of typhoid should be left in the room with another patient. The strictest quarantine should be carried out, and all discharges thoroughly disinfected with chloride of lime. All linen should be soaked in bichloride solution, then boiled for one-half hour. Sunlight and fresh air are the most effective disinfecting agents and where possible should be employed.

The Food.—All food must be liquid; no solid food should be allowed. In the beginning whey, strained soups, and broths should be ordered; later strained gruels may be given at intervals of three to four hours. In some cases albumin water, made by beating the raw whites of two eggs with sugar and water, is useful. I frequently give the whites of six eggs per day. Milk, buttermilk, kumyss, whey, or junket may be given, alternating with soups and broths. When stimulation is required the yolk of egg can be combined with sherry wine. When drugs are given it is best to combine them with soups or broths. When severe dyspeptic symptoms exist, predigested milk, peptonized with the aid of pancreatin and soda, must not be forgotten. When milk idiosyncrasies exist, then the yolk of a raw egg added to barley water, rice water, or almond milk (made by blanching almonds with hot water) can be substituted for milk. When thirst exists, unfermented grape juice or water acidulated with dilute phosphoric acid or dilute hydrochloric acid is very grateful. Ten drops of either dilute acid can be added to a tumblerful of sweetened water, and this given whenever the child is thirsty. These acids have a very good effect on febrile affections, and are especially indicated when diarrhea exists.

The great danger of hemorrhage should always be borne in mind; hence it is advisable to abstain from giving solid food for several weeks after convalescence is thoroughly established. Soups thickened with sago, farina or barley, and pea and lentil soups can be given. The yolk of a raw egg can be added to the soup. Milk may be thickened with zwieback. The main diet should be milk. Liquid peptonoids in teaspoonful doses added to milk is very valuable during the convalescent period. Valentine's meat juice given in milk or soup is nutritious.

XIII.

ERYSIPELAS.

THIS is an acute infectious and contagious disease. It is characterized by an inflammatory condition of the skin, the subcutaneous tissue, the lymph spaces, and the lymph vessels.

Bacteriology.—We are indebted to Fehleisen for a study of this disease. Fehleisen found the streptococcus present, so that it is positively identified as the cause of the same. The disease may also originate from a staphylococcus aureus.

The invasion of the micro-organism takes place through an abrasion of the skin caused by scratching with a dirty finger-nail. It is very rarely epidemic, but can spread easily from patient to patient. A case of erysipelas is a source of great danger in a hospital ward.

Pathology.—There is an infiltration of the tissues and they are usually swollen from an accumulation of serum. Under the microscope we can find pus cells in the serum. When this condition is noted abscesses will be found. In other cases gangrene will be present. There is nothing characteristic found in the lungs, heart, kidneys, spleen, or liver which would be distinctly pathognomonic. The usual conditions found in sepsis are seen here.

Pneumonia is sometimes met with as a complication.

Etiology.—This infection usually attacks children with lowered vitality. It is found in the infant as well as in the older child. The virulence of the organism is such that regardless of the condition at the time of infection the toxin so destroys the red cells and also poisons the central nervous system that a general blood poisoning supervenes within one or two days. Whether scratching with a finger nail or with a rusty nail is responsible for the invasion of the streptococcus, the result is the same. Surgical instruments used on a patient suffering with erysipelas can transmit the disease.

An abrasion of the skin near the nose, or anus, or an abrasion on any part of the body may be the point of entrance of the infection.

Symptoms.—From a small red flush the inflammation will spread very rapidly. In appearance it is shining and indurated to the touch. Fever always accompanies the disease. The temperature in the beginning is 102° or 103° F., and rises rapidly to 104°, 105°, or even 106° F. Such febrile reactions should be re-

garded as a normal response to the streptococemia, and does not necessarily imply a fatal termination. The pulse-rate varies between 120 and 150. If the pulse-rate increases and is irregular or intermittent then the case is progressing unfavorably. Septic cases having a temperature of 99° F. usually accompany severe infections.

Complications.—Edema affecting the skin frequently occurs; when it affects the air passages it should be regarded as a grave

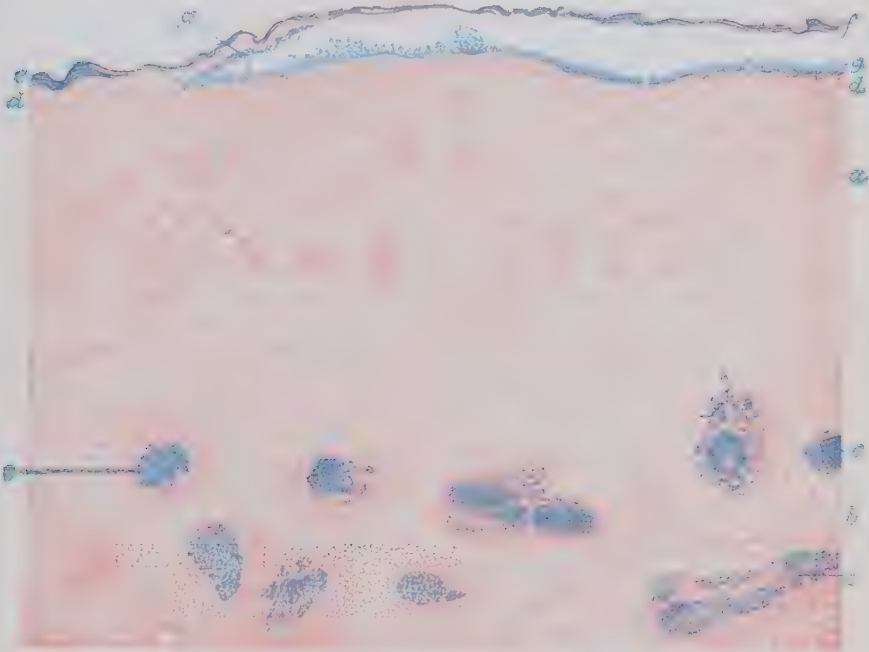


Fig. 194.—Ectogenous streptococcus infection. Eczema and erysipelas of the scalp in a child 1 month old. (Bacteria carmine stain); (a) cutis. (b) subcutis; (c) lymph vessels filled with streptococci, surrounded by an inflammatory area; (d) epithelial covering; (e, f) elevated horny layer; (g) streptococci. $\times 50$. (Ziegler.)

symptom. When edema affects the air passages, especially the glottis, laryngeal stenosis will result. Unless intubation is performed to relieve the stenosis such cases end fatally. Multiple furunculosis or pyemic abscess frequently follow erysipelas. Sometimes pustular eruptions follow.

Prognosis.—The condition of the child at the time of the infection, and the length of time that has elapsed since the infec-

tion was first noted are the points upon which we should base our prognosis.

While a generalized infection of one-half or more of the surface of the body means a very serious condition, I have seen cases regarded as hopeless, recover when treatment was persisted in. If the child is well nourished and has been breast-fed, the prognosis is good.

Treatment.—*Vaccine*: In a mild case 50,000,000 to 100,000,000

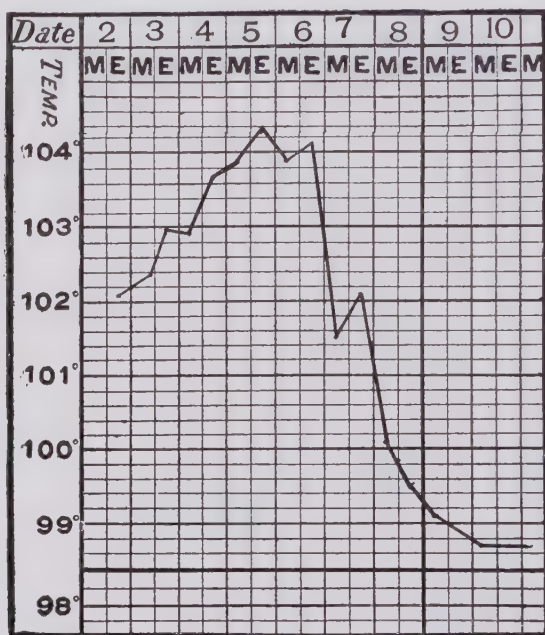


Fig. 195.—Fever curve in facial erysipelas.

of erysipelas stock vaccine should be injected on the first day. Repeat the injection every day until ten injections are given, or until the symptoms improve. Severe cases may have an initial injection of 500,000,000.

Baby C., 6 months old, a nursing baby, was seen by me several times in consultation. When first seen the infant had been ill three days. The temperature was 105° F., pulse 168, and respiration 80. There was marked cyanosis, vomiting, extreme weakness, and retention of urine. There was a marked erysipelatous flush on the vulva which spread very rapidly toward the abdomen and thighs.

The inflammation on the vulva was of a deep-red color. There were thickening and edema, while spreading to the buttocks and up the back we

could note a sharply defined edge. There was slight pitting on pressure. The redness seemed to disappear under pressure. The redness was of an erythematous character, uniform and not mottled. The skin was tense and shiny. The surface temperature was raised. The inflammation spread from the buttocks to the back, then to the thorax, and downward to the extremities. From the back it spread to the neck, scalp, and face, closing the eyes. There was marked thickening with swelling which involved the ears, cheeks, nose, and neck. This swelling of the face did not interfere with feeding.

Three or four days after the extension of the swelling from the buttocks to the back, there was a marked diminution in the redness and swelling, but the new areas involved were considerably indurated, tense, and hot on palpation. In three or four days more the scalp, ears, and nose which were swollen became less shiny, and the swelling gradually subsided. With the reduction of the swelling and inflammation there was a marked desquamation. The arms and legs were the last to be involved. They went through the same process of redness and thickening which lasted four to five days longer.

From the spreading nature of the disease, I believe we can classify this case as one of erysipelas migrans—the wandering type of erysipelas.

During the course of the disease the behavior of the infant was remarkable. As previously stated, it was a breast-fed infant who took its nourishment at the regular intervals, with the same appetite as when in health. The stool was well digested and normal in appearance and there seemed to be no evidence of faulty metabolism. The infant seemed therefore to offer good resistance to its infection, notwithstanding the fact that the temperature remained unusually high.

Diagnosis.—Erysipelas migrans of unknown origin. The sanitary surroundings were perfect. There was no apparent reason for the infection. The lungs were normal, although the pulse-respiration ratio was markedly disturbed and suggested a pulmonary complication.

The leucodescent light was tried three times a day, the rays covering the affected area. Ichthyol ointment also, was used without markedly diminishing the inflammation. The local application of lead and opium wash, and other evaporating lotions did not seem to reduce the temperature nor to modify the inflammation. The swelling continued in spite of the continued use of these lotions.

I have seen excellent results during my service at the Willard Parker Hospital from the constant use of a saturated solution of magnesium sulphate used locally. In this case it did not modify the inflammation. The erysipelas continued to spread, so the light treatment was discontinued and serum treatment was begun.

There was marked fluctuation in the labial swelling and a drop of pus examined showed the presence of *Staphylococcus pyogenes aureus*.

On the fourth day of illness an injection of 75,000,000 organisms of a streptococcus stock vaccine was given. On the sixth day, 50,000,000; on the seventh day, 60,000,000; on the ninth day, 70,000,000 bacteria were injected. A decided improvement was noted. By this time we had obtained an autogenous vaccine and gave the first injection of 100,000,000, a second injection of 100,000,000 plus 100,000 the following day. On five successive days injections, each 100,000 more than the last, were given.

On the fifth day following the first vaccine injection an abscess on the right labium major was incised. A general multiple furunculosis on the arms, scalp, thighs, and back appeared in rapid succession. A general pyemia existed. In addition thereto a pustular eruption appeared on the face and head. Several dozen of these were incised and pus evacuated.

Summary.—A reduction of the temperature was tried with lukewarm colonic flushings, also by means of tub baths, but without avail. Ichthyol was useless, likewise magnesium sulphate in a saturated solution. Neither seemed to reduce the inflammation or the temperature. Breast feeding was continued throughout the disease, and continued after complete recovery. The streptococcus vaccines, both stock and autogenous, brought down the temperature by lysis, and this seemed very effectual in modifying the erysipelas. It is difficult to state whether or not the migration of the staphylococcus through the circulatory tract was responsible for the multiple furunculosis, the numerous pyemic abscesses, and the pustular eruption on the face and scalp. The large dosage of the vaccine given and the non-toxic results therefrom show the tolerance this infant had for the same. The child made a brilliant recovery, and is perfectly well to-day.

Local Treatment.—Pure alcohol, in which bichloride of mercury is dissolved, should be applied continuously by saturating absorbent cotton and laying the same over the erysipelatous flush:

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| R Alcohol | 2000 parts |
| Bichloride of mercury | 1 part |

In some cases lead water is very cooling, and will remove the heat from the affected parts. In severe cellulitis and erysipelatous inflammations excellent results have followed the use of:—

| | |
|---------------------------|-----------|
| R Magnesia sulphate | 2 drams |
| Aqua | 16 ounces |

applied as a lotion.

Oiled silk or rubber tissue should cover the wet application to prevent evaporation. The inunction of a 10 per cent. ichthyol ointment has been used by me without success.

Internal Treatment.—Fever should be reduced by means of tub baths. Colon irrigations should be given twice daily—one teaspoonful of bicarbonate of soda to one pint of lukewarm water. A dose of rhubarb and soda or 5 to 10 grains of phosphate of soda should be given. The strictest hygienic measures must be used. The strength of the child must be supported with proper food, so that it can throw off the poison. The most effectual treatment is the local treatment especially if fever exists.

Dietetic Treatment.—Milk, thin gruels, and broths with purée of vegetables added should form the bulk of the diet. Fruit juices and stewed fruits should be ordered. Water should be permitted liberally.

XIV.

MALARIAL FEVER (INTERMITTENT FEVER— PALUDAL FEVER—AGUE).

THIS is a specific infectious disease due to the invasion of a distinct germ belonging to the class of protozoa. It is known as the plasmodium malarix. The disease is contracted by the inoculation of the human subject by the infected mosquito. The plas-

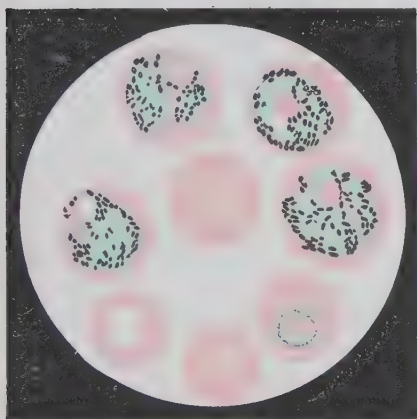


Fig. 196.—Malaria plasmodia; tertian type. Plehn-Chenzinsky's stain. $\times 1000$.

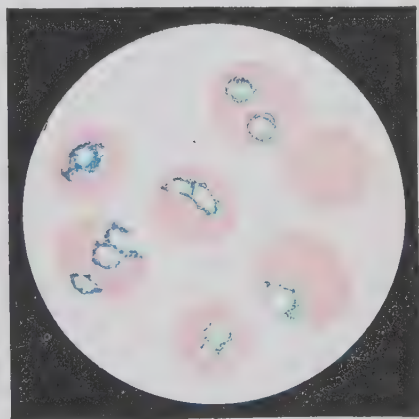


Fig. 197.—Malaria plasmodia; tropical form. Romanowsky-Nocht stain. $\times 1000$.

modium malarix passes through one cycle of its development in the body of a variety of the mosquito known as the anopheles.

We find this disease in Southern Russia and in Italy; in our own Southern States as well. In the North of Europe and the North of America it is rarely found. The disease is usually seen in swampy regions and where bad drainage exists. It is also seen in the tropics. The influence of the weather is interesting. While in summer, spring, and fall cases occur frequently, in extremely cold weather they are very rare.

Bacteriology and Etiology.—Laveran, in 1880, discovered the specific germ which causes this disease in the blood of infected individuals. In America, Councilman, Abbott, Osler, and many others

have confirmed Laveran's observations. There are several types of fever.

First.—The middle forms: (a) tertian, double tertian (quotidian); (b) quartan fever and its combinations.

Second.—The more severe, often more or less irregular fevers which occur in America and in Italy, most commonly at the end of the summer and fall, called the *æstivo-autumnal* fever of the Italians. The tropical malaria of the Germans. This type of fever includes the so-called remittent malarial fevers as well as most of the cases of pernicious malaria and other malarial cachexiæ.

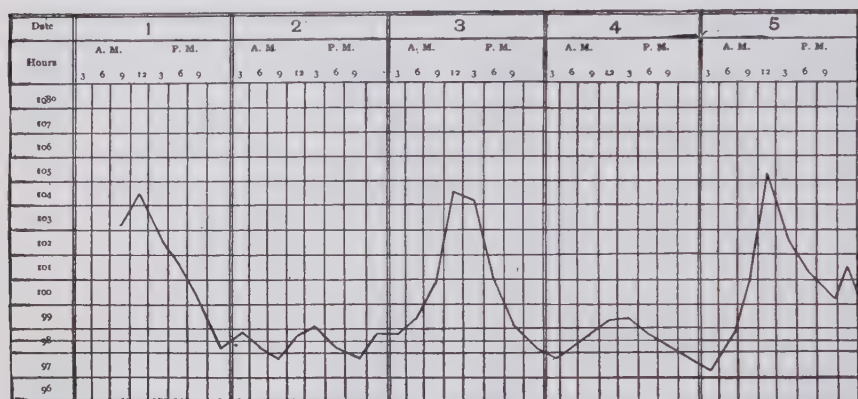


Fig. 198.—Tertian fever (intermittent fever). Typical malarial temperature, usually seen in the spring and early summer. Onset with vomiting, diarrhea and chills, accompanied by a well-marked rigor, and coldness of the extremities.

Tertian Fever.—Golgi's description and differentiation of the micro-organism of the tertian and quartan type of malaria have remained practically unassailed. If we examine the blood from a case of tertian fever just after the paroxysm, we find in certain of the red blood-corpuscles small, round, colorless bodies which appear to have a slight depression in the center, and when stained in dry specimens show a paler central area with a darker periphery. These bodies examined in the fresh specimen show active ameboid movements. A few hours later the organism will be found to have increased somewhat in size, and to contain a few, fine, brownish pigment granules which dance actively under the eye, the motion probably being due to undulatory movements in the protoplasm. On the day between the paroxysms the bodies will be found to have about

half-filled the red corpuscles. They are still actively ameboid, and the number of pigment granules has considerably increased. The red corpuscle at this stage will be seen to be a trifle larger than its unaffected neighbors, and to be considerably decolorized. On the day of the paroxysm the organism has entirely filled and almost destroyed the red blood-corpuscle, which is represented only by a faint pale rim about the full-grown parasite, if, indeed, it has not entirely disappeared. The pigment granules may show at this stage a very active motion, but the ameboid movements of the organism as a whole are but little marked. At the time of the paroxysm an interesting change takes place; the pigment gathers together in a more or less solid clump, usually in the center of the organism, while the rest of the protoplasm looks somewhat granular and shows a suggestion of lines radiating outward from the center. This appearance gradually changes, the lines becoming more distinct, until finally we see the central clump of pigment surrounded by from fifteen to twenty small ovoid or round glistening segments, each one having a central more refractive spot, and resembling strongly the hyaline bodies which we see immediately following the chill. This segmentation of the organism is always coincident with the paroxysm, and the presence of the blood of a segmenting body is a sure indication that the paroxysm is present, or is about to occur. Immediately following the paroxysm fresh hyaline bodies appear in the red corpuscles. Though the invasion of the corpuscles by these fresh segments has never been actually observed, the evidence that this occurs is so strong that we can safely accept it as a fact. Besides these forms we see not infrequently small or large extra cellular pigmented bodies; that is, organisms resembling exactly those within the red blood-corpuscles, excepting that they are free in the blood current.

These may be seen at times to break up into several smaller bodies, while at other times they may show a long, tail-like, non-motile process containing sometimes a few pigment granules. They are probably organisms which have escaped from the red corpuscles, or full-grown bodies which have broken up; they are considered to be degenerative forms. At times also we find the so-called flagellate bodies. Their development from the pigmented organism may indeed be observed, the pigment of the full-grown body becoming very actively motile, then collecting in the center of the organism, while several long, thread-like flagella burst out of the body and move actively about among the surrounding corpuscles. Sometimes we may see one of these flagella which has broken away from the or-

ganism and is moving rapidly through the field. This is also thought by the Italians to be a degenerative process. The characteristics of this form of organism, which is observed in tertian fever alone, are so marked that with a little study of the parasite one can make a definite diagnosis of the type of fever from an examination of the blood alone.

The Parasite of Quartan Fever.—Quartan fever is not at all common in this country, but in the few cases which the writer has observed the organisms differ distinctly from the tertian parasite, and show accurately the characteristics described by Golgi. Here the first stage of the organism is similar to that observed in tertian

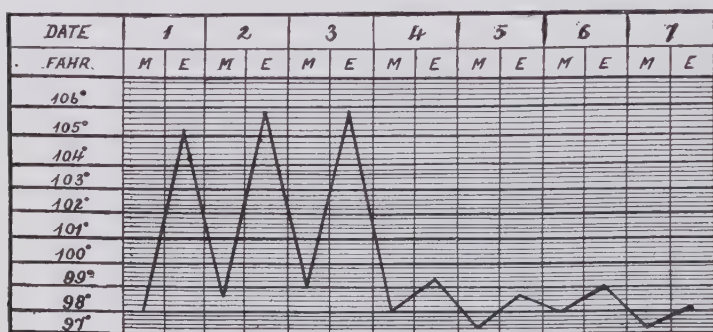


Fig. 199.—Quartan fever (double tertian). Onset with vomiting and convulsions. Convulsions usually accompany each paroxysm. Restlessness associated with cyanosis and coldness of extremities. These cases are usually seen in the late autumn.

fever, excepting that the ameboid movements are not so active. As the body develops, the rods and clumps of pigment are larger and darker than those in tertian fever, while the ameboid movements of the organism are relatively slight. The full-grown forms are materially smaller than in tertian fever, while the red blood corpuscles, instead of being expanded and decolorized, appear at times shrunken about the body, and of a somewhat deeper old-brass color (messingfarbe). In segmentation the organism divides into from six to ten different parts instead of twenty to thirty, as in the tertian form.

The Organisms of the Estivo-autumnal Fevers.—The organisms associated with the estivo-autumnal fevers have been carefully studied, but much remains to be done, particularly in this country.

There is some difference of opinion as to whether there are not two types of organism associated with these fevers. Some Italian observers divide them into the quotidian and the malignant tertian organisms. The differences made out by the Italians are, however, very slight, and have not been observed in this country. In the first place we see just after the paroxysm small hyaline bodies which may or may not be actively ameboid; these can sometimes be distinguished in that they are generally somewhat smaller and have oftentimes a characteristic ring-like appearance. In the early stages—during the first week, for instance—of an attack of this form, we may see only the hyaline,

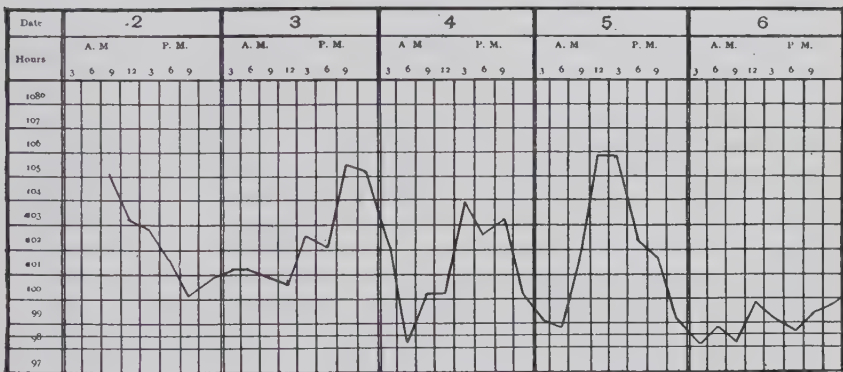


Fig. 200.—Estivo-autumnal fever (mild type). Ushered in with vomiting, restlessness and flushing. The spleen is enlarged. Either delirium or drowsiness and somnolence exists.

unpigmented forms; but commonly, if we observe carefully, we may see some time after the exacerbation of temperature, shortly before the beginning of another, bodies which are a trifle larger than these smallest hyaline forms and which contain one or two very minute pigment granules lying near the periphery. Just before or during the paroxysm we may see bodies with a small central clump of motile or non-motile pigment granules lying usually in cells which are more or less shrunk and crumpled, and of a deeper color than the normal corpuscles (messingfarbe). These bodies are generally not half as large as the red corpuscles. After the first week or ten days of the disease, or after treatment has been begun, we see, however, certain very characteristic and easily recognizable forms which are only seen with this type of fever. These are, first, round or ovoid bodies about the size of

a red corpuscle, a little smaller or a little larger, with clear, rather highly refractive, waxy-looking protoplasm, and coarse dark pigment granules, which are usually collected in a ring or a mass in the center of the organism. The granules are usually very slightly motile. At one side of the body we often see a small bib-like attachment which may show a slightly yellowish color. On examination this proves to be the remains of the red blood-corpuscles in which the organism has developed. In association with these are seen crescentic bodies, the protoplasm of which shows the same characteristics as that in the forms above described, while the pigment is collected in the middle in a similar ring or bunch, and is but slightly motile. On the concave side of these crescents one may also often see a bib-like attachment, just as in the ovoid forms.

At times during the examination of the fresh specimen we may see the change from an ovoid body into a crescent take place. The development of these forms from the hyaline bodies can be followed out on careful observation. They are thought by some to be a resting stage of the organism. Segmenting bodies are almost never seen in the circulating blood of this form of malarial fever, though the presence of the round intracellular bodies with central pigment is a sure sign that segmentation is going on elsewhere. It has been found by the Italians that after the accumulation of a few pigment granules the organisms seek the internal organs, where segmentation takes place. The bodies are still small and contained within the red corpuscles. The pigment gathers in the center, as in the other types of segmentation, while the segments are very small and rarely more than twelve in number.

During the paroxysm we may see large numbers of leucocytes containing pigment granules and clumps which are probably the remains of segmenting organisms. Flagellate bodies may be observed here as in the tertian and quartan fevers, but only when ovoid and crescentic pigmented bodies are present. They may be seen to develop from the round bodies with central pigment.

Careful studies concerning the morphological characteristics of the malarial parasite have shown that it belongs to the class of protozoa, and is possessed of a nucleus containing one or more nucleoli. At the time of sporulation this nucleus divides—according to some—directly, according to others by karyokinesis.

Pathology.—In fatal malaria the following changes are found:

The spleen is enlarged; the capsule tense. Death has been reported from rupture of the spleen (Thayer). The pulp of the spleen contains large numbers of red blood corpuscles in which the characteristic parasite is found. The capillaries are usually filled with the plasmodia, while the splenic veins show relatively few, though they always contain large cells enclosing pigment or the remains of red corpuscles.

The Liver.—Small areas of necrosis are described by Guarnieri:

Numerous liver cells are found containing clumps of hematin and altered red corpuscles, a condition similar to that found in pernicious anemia. Bignami believes that this may explain the polycholia found in cases that died of pernicious malaria.

Examination of the Blood.—A small drop of blood should be taken from the ear or from a finger tip. The usual aseptic precautions, such as carefully washing the finger with soap and water, followed by a washing with alcohol or ether, should be strictly carried out. Fresh blood must be examined soon after it has been withdrawn—no later than three or four hours. A film of blood can be preserved if the air is excluded by smearing vaseline around the edges of the cover glass. The ameboid movements of the protozoa can be studied in this fresh blood. *Blood for examination should be drawn about one hour before the expected paroxysm. The organisms are much smaller after a paroxysm.

The tertian parasite completes its life in about forty-eight hours, or less, if there is any variation from this time. In the first twelve hours of their life the parasites appear as small, clear specks (hyaline bodies) in the red corpuscles, and if any pigment is to be seen it is as very small granules. If stained they appear pale blue. They are actively ameboid, and remain so for about an hour after withdrawal. In the next twelve hours the parasites have grown to about one-third the size of the corpuscles, are still ameboid, show fine granules, and the corpuscle has become paler. In the next twelve hours the parasites have taken up about two-thirds of the cell, have become less ameboid; the granules larger and moving. The parasites are now more irregular in shape, and the corpuscles larger and paler, the pigment granules standing out more markedly. In the next twelve hours all motion ceases, the corpuscles become shells, the centers of which are occupied by the parasites, and spore formation and segmentation begin. The organisms break up into fifteen or twenty round spores, at first contained in-

TABLE No. 59.

| Simple Intermittent Fever. | | | | | | | | | | |
|------------------------------------|---|--|--|---|---|----------------------------|------------------|---|--|--|
| | Develops in | Movements. | Pigmentation. | Maximum Size. | Forms of Spore Formation. | Number of Spores. | Crescent Bodies. | Alterations in the Infected Blood-corpuses. | | |
| Quartan parasite. | Seventy-two hours. | Small movements in immature forms. | Coarse granules, little or no movement. | Size of red blood-corpuses. | Daisy form, single spores, round, with distinct nucleolus. | 6 to 12. | None. | Red blood-corpuses are little discolored and do not alter their size. | | |
| Ordinary tertian parasite. | Forty-eight hours or less in antcipating cases. | Active ameboid movements in immature and also in middle-aged forms. | Fine granules in immature forms, often in the larger, actively swarming. | Size of red blood-corpuses, sometimes larger. | Sunflower or grape-like, single spores, small round nucleolus; rarely seen. | 15 to 20, often less. | None. | Red corpuses are often hypertrophied, and lose their color quickly and completely. | | |
| Pigmented quotidian parasite. | Twenty-four hours. | The unpigmented immature forms actively ameboid, less active when the pigment accumulates. | Very fine, later coalesced in one or two lumps. Does not swarm. | One-fourth to one-third the size of red blood-corpuses. | Irregularly formed heaps. | 6 to 8, often more. | Present. | Red blood-corpuses often shrink, and are thin, either take stain copper-colored or may be completely decolorized. | | |
| Unpigmented quotidian parasite. | Twenty-four hours or less. | Very active, ameboid movements. | None. | One-fifth to one-fourth the size of red blood-corpuses. | Star-shaped or in irregular heaps. | 6 to 8. | Present. | Red corpuses shrink frequently and are darker stained. | | |
| Malignant tertian parasite. | Forty-eight hours. | Active movement remains present in pigmented bodies. | Moderately fine; often shows the oscillatory movement. | One-half to two-thirds the size of red blood-corpuses. | Irregular heaps. | 10 to 12, rarely 15 or 16. | Present. | Red blood-corpuses shrink frequently, are darkly stained, or may be perfectly colorless. | | |
| Malignant or Bilio-Autumnal Fever. | | | | | | | | | | |

Simple Intermittent Fever.

Malignant or Estivo-Autumnal Fever.

side the cell-wall of the red corpuscles, and then set free into the blood. It is at this time that the clinical paroxysm occurs. All hyaline bodies do not develop to the stage of spore formation, nor do all these spores—really the young hyaline bodies—which have been set free into the blood serum re-enter the red corpuscles, but the blood plasma itself destroys many of them.

Should we have under observation clinically a quotidian form of malaria, the red corpuscles would show the tertian parasite in but two stages of development, one group being approximately twenty-four hours older than the other; of course, depending upon the hour at which the paroxysms occur. This is due to a double infection. It must not be forgotten, however, that we may have a triple quartan infection that produces daily paroxysms.

The quartan parasite grows in seventy-two hours. In the first twelve hours it is a very small, unpigmented, slightly ameboid, hyaline body, becoming in twelve hours more about the size of one-sixth to one-fifth that of the corpuscles, having taken on a few pigmented granules placed peripherally. In forty-eight hours it is one-half to two-thirds the size of the red corpuscle, round, as a rule, and possessing no ameboid movement. In sixty hours from the paroxysm, it occupies nearly all of the corpuscle, which is neither enlarged nor paler than normal. In six hours more the pigment granules approach the center and are arranged like the spokes of a wheel, the first sign of segmentation. About three hours before the attack, segmentation has produced from six to ten oval or pear-shaped bodies or spores containing pigment in their centers. In multiple infections of this type we, of course, find the organisms in the blood in different stages of development. Flagellated bodies develop after the blood is removed from the body, and consist of a central cell with arms thrown out. These arms are freely movable. In examining a fresh specimen, we may see such a body keeping up a constant ciliary motion and causing a disturbance in the arrangement of the red cells in its immediate neighborhood. The flagellated body does not often appear in either of the foregoing types of the infection, but is more common in the estivo-autumnal variety. The second group of parasites belongs to the class of malignant or estivo-autumnal figures, and are divided into, *first*, the pigmented quotidian parasite; *second*, the unpigmented quotidian parasite; and *third*, the malignant tertian.

The pigmented quotidian parasite completes its cycle in twenty-four hours. When seen in the blood-corpuscle, it appears as a

small actively ameboid, hyaline body, rapidly becoming pigmented and quiet, the pigment lodging in the periphery of the organism, after which it breaks up into spores. It has been pointed out that segmentation of this type does not take place in the peripheral blood, but occurs in the spleen and bone marrow. The pigmented organism occupies one-third of the corpuscle which is shrunken, if changed at all. After the infection has lasted for several days crescents appear.

Crescents are always an evidence of estivo-autumnal fever, and never occur in the quartan or tertian type. They are from eight to ten micromillimeters in length and from two to three micromillimeters in breadth, are half-moon shaped when typical, but vary greatly, oftentimes appearing almost straight. They contain pigment sometimes scattered, but oftener found clumped in the center, and usually without motion. With a good light and an accurate adjustment the shell of the red blood-corpuscles can be seen extending from the poles of the crescent, showing that this parasite is distinctly an intracellular formation. Crescents are distinctly an evidence that the infection has lasted a number of days,—five or six—and they will not be found in any specimen before that time. The unpigmented quotidian parasite shows not many variations from the foregoing type, except that it is free from the pigment, though the crescents formed from this variety may show pigmentation. The malignant tertian parasite is pigmented and, in fact, much like the pigmented quotidian. It grows to segmentation once in forty-eight hours, and is ameboid in the advanced stage; the pigment is active and the entire organism is larger. Probably no better idea can be given concisely of the different characteristics of these parasites than by reproducing the table of Mannaberg. (See p. 780).

Malaria has been reported in the newly born infant. It is met with in children of all ages. Every irregular type of fever occurring in those living in malarial districts where the anopheles exists should be carefully studied until malaria is excluded.

The parasite may remain dormant for many weeks before showing activity. In New York we rarely have a true case of malaria, and when they do appear we can trace them to some other locality.

A most interesting case of malaria was seen during my service at the Willard Parker Hospital in a child suffering with scarlet fever. It was a septic scarlet in a boy 9 years old. Owing to the severe anemia we decided to do a transfusion. The immediate effect of the transfusion was apparent

in a better pulse, more vitality, and a general improved appetite. On the day following the transfusion the nurse called my attention to a violent chill followed by a very high temperature. A suspicion of gastric infection existed and a cathartic ordered. On the following day in the afternoon another chill was followed by a rapid rise in temperature. The spleen seemed enlarged and a blood examination was made. This showed the presence of the malarial micro-organism (*hematocytozoon malariae*).

This child had a double tertian infection which subsided within twenty-four hours after the administration of quinine. The child had obviously been infected with the plasmodia in the blood of the donor.

Symptoms.—In very young children there may be convulsions, restlessness, cold extremities, and yawning. The pulse is full and rapid. The temperature may reach as high as 105° F., or even higher. After this febrile stage the body is covered with a profuse perspiration, ending in sleep from exhaustion. Diarrhea is occasionally met with in this condition, and is probably the result of secondary infection. Bronchitis is occasionally seen. The paroxysm of fever occurs when the protozoa matures and begins to divide. This process repeats itself about every twenty-four hours in the tertian type of intermittent fever most frequently seen in this country. If children are carefully observed, then the onset of a paroxysm is frequently seen by a severe cyanosis affecting the nails. This would correspond to the chill seen in the older children. Slight albuminuria or hematuria frequently accompanies malaria. There is no disease that can be mistaken for the tertian type of malaria when it is remembered that there is a sick day with fever, etc., and an alternating apparently healthy day.

An enlarged spleen is usually present.

Diagnosis.—This can be made by an examination of the blood. So many symptoms present in malaria, such as lassitude, pains in the bones, headache and fever, simulate other diseases, that only the positive finding of Laveran's protozoa in the blood will complete the diagnosis.

Differential Diagnosis.—If there is a doubt as to the differential diagnosis between tuberculosis and malaria, the specific effect of a few doses of quinine will easily show the presence or absence of malaria. The blood test is, however, conclusive.

Prognosis.—The prognosis is usually good. If neglected, secondary anemia may follow. In some cases fatal results will occur.

The specific drug in malaria is quinine. The bisulphate of quinine or the hydrochlorate of quinine are most effective. Beginning with 2 grains three times a day the dose is increased until 5 grains three times a day are taken. Quinine is most specific when administered three hours before the expected rise in temperature. Next to the specific effect on the malarial micro-organism we should give eliminative treatment and cleanse the intestines with a daily dose of one-half teaspoonful of fluid extract of senna given in orange-juice. Small doses of whiskey diluted with water can be given with each dose of quinine. A change of air is imperative. A change from the city to the country, or *vice versâ*, is very beneficial. If this infection took place in the South remove the child to a different latitude. After the malarial infection has subsided small doses of Fowler's solution, 1 drop three times a day, may be given for one month. If Fowler's solution is not at hand then $\frac{1}{100}$ grain arseniate of soda three times a day should be given for at least one month.

Nutrition should be aided by giving concentrated foods such as milk with the yolk of egg, concentrated broths, custard, junket, vegetables, and raw scraped beef. Liquid food should be given every three or four hours to aid metabolism and stimulate nutrition. *The best time for administering quinine is about three hours before the expected attack.* The bisulphate of quinine is a soluble and convenient form to use.

Owing to the disagreeable taste it can be given in tablet form, after which a mouthful of coffee or chocolate can be given. When quinine is refused by mouth, then a 10-grain dose in the form of a suppository can be given three times a day, per rectum. It is very important to keep the bowels open and the kidneys active. Fifteen to 30 drops of fluid extract of cascara sagrada can be given in a palatable menstruum every morning, so that the action of the bowel is assisted. In true malaria, I have found especial benefit in administering whiskey well diluted with water, or given in milk. Apart from its nutritive properties, it certainly has decided antiseptic properties. If malaria persists in spite of continued treatment, then arsenious acid in doses of $\frac{1}{100}$ or $\frac{1}{150}$ grain, can be administered three times a day. Fowler's solution, in doses of 1 to 5 drops, should not be forgotten. Jacobi recommends ergot in doses of 20 to 50 drops every day for weeks. When it is not well borne he com-

bines it with quinine or arsenic. I have never been able to see the slightest benefit from the use of ergot, although I have tried it in many cases. I believe Jacobi's results were good when he combined the ergot with the quinine *because the quinine* was given.

Σ

XV.

SYPHILIS.

THIS is a specific disease most probably caused by the invasion of a micro-organism called *Treponema pallidum* (spirocheta pallida) discovered by Schaudinn and Hoffman¹ in 1905. The disease in infancy is the same as that in adults. There are two forms of the disease:—

1. Inherited syphilis.
2. Acquired syphilis.

Pathological Anatomy.—In obscure inflammatory lesions involving the meninges or spinal cord, it is necessary to submit the spinal fluid as well as the blood to the Noguchi or the Wassermann test. While the Noguchi test is very sensitive, one should not fail to utilize the Wassermann to confirm the presence or absence of a positive reaction. *In acquired syphilis* changes are the same in the child as in the adult.

In hereditary syphilis there are certain constant changes present in the bones. These changes are confined to the shafts of the long bones and to the cranial bones.

The pathological changes are not confined to the epiphyses, but the diaphyses are also swollen. The ends of the bones are swollen. The inner portion of the periosteum shows swelling and hyperemia.

The circulatory apparatus shows thickening of the arterial walls as well as of the veins. Owing to this degeneration there is a tendency to bleeding. (See clinical case described in this chapter.)

Catarrhal manifestations showing implication of the respiratory tract, and also the gastrointestinal tract, can be noted. The liver, spleen, and pancreas are enlarged.

The lymph glands of the entire body are enlarged.

Etiology.—Rarer means of infection are:—

By nursing from the breast of a syphilitic wet-nurse.

Eating from the dishes of syphilitic patients.

Unclean surgical instruments; for example, when an infant is vaccinated, or during the operation of circumcision.

¹ SCHAUDINN and HOFFMAN: Arbeit. a.d. Kaiserl. Gesundh., 1905, xxii.

The Transmission of Syphilis in Utero.—An infant in utero may be infected directly through the circulation in the placenta. If the mother acquires syphilis during the ninth month of her pregnancy, the same will not infect her child nor modify its development. A healthy infant in utero can be infected by passing through a syphilitic genital tract of its mother during labor.

When the ovum is infected with syphilis, which frequently happens at the time of conception, it may terminate in the death

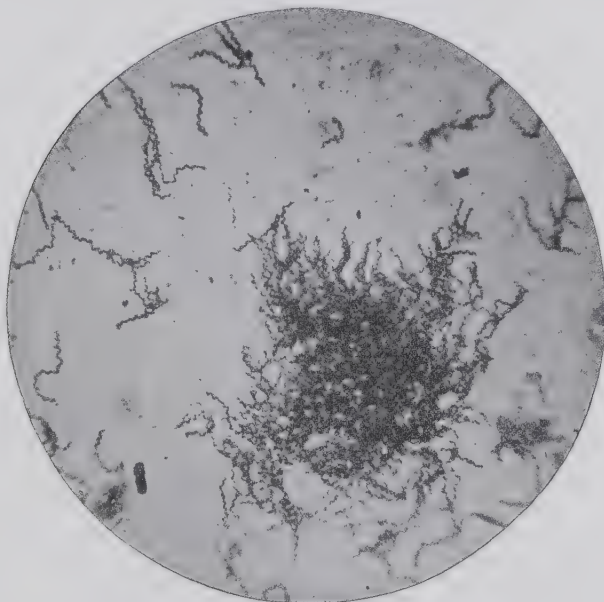


Fig. 201.—*Spirocheta pallida*. Macerated skin of fetus.
(Courtesy of the Rockefeller Institute, New York.)

of the fetus, resulting in an abortion or in the birth of a still-born child. If the child lives it may suffer with cachexia, and a few weeks later present the characteristic skin-lesions. The father can infect the mother for three or, at the most, five years after his chancre. The father may infect the fetus as late as twenty years after his chancre, when for years he has presented no signs of syphilis. The mother may have a series of syphilitic pregnancies resulting in miscarriages or in syphilitic infants, without at any time herself presenting any syphilitic manifestations. In the same couple the severity of the infection transmitted to the fetus

tends to decrease with succeeding pregnancies. Thus it is the rule for the mother to have at first several abortions, then a child born dead, and finally a living child showing the evidences of inherited syphilis. Children born later usually suffer less severely, but this "law of decreases" (Diday) is not without numerous exceptions; sometimes the third or fourth child suffers more than the second. In other families children of one sex suffer more than those of the opposite sex. In twin pregnancies one may be affected while the other apparently escapes. The apparent escape of the mother of syphilitic infants by a syphilitic father has been accounted for on the supposition that she undergoes a mitigated infection derived from the fetus. Coutts¹ has pointed out the theory that she absorbs from the fetus a syphilitic anti-toxin; this would account not only for her apparent immunity, but also for the gradual decrease in the severity of the disease in later pregnancies. If the mother be infected but not the father, death of the fetus is the most likely result. If the child is born alive it will probably suffer from inherited syphilis. If both parents have suffered from manifest syphilis, the chance of abortion or still-birth is greater.

Colles's Law.—In 1837 Colles wrote that "A new-born child affected with inherited syphilis, even though it may have specific lesions in the mouth, never causes infection of the breast which it sucks if it be the mother who nurses it, although continuing capable of infecting a strange nurse." The substantial truth of this dictum has not been seriously questioned, though various explanations have been offered.

*Butyric-acid Test for Syphilis.*²—This test depends on the precipitation of globulin, either in the blood-serum or in the cerebro-spinal fluid. The Noguchi test consists of the following:—

From one-tenth to two-tenths cubic centimeters of cerebro-spinal fluid, which is absolutely free from blood, is mixed with one-half cubic centimeter of a 10 per cent. solution of butyric acid in normal saline, and boiled. Then one-tenth cubic centimeter of 4 per cent. sodium hydroxid solution is quickly added, and the whole boiled for a few seconds. A granular or floccular precipitate means a positive reaction. The precipitate appearing within a few minutes indicates a large increase in globulin, while

¹ COUTTS: Some Aspects of Infantile Syphilis.

² I am indebted to Hideyo Noguchi for assistance in the preparation of this article.

a weaker reaction may not appear for an hour or two, two hours being the time limit.

If this test gives the spinal fluid only a slight opalescence or turbidity and no granular precipitate, then we can consider the fluid normal after the usual time limit has been reached.



Fig. 202.—Syphilis. Child 14 years old. A productive periostitis enclosing the shafts of the long bones. Absolutely characteristic of syphilis.

With the cerebrospinal fluid, a positive reaction occurs in any case of syphilitic or parasyphilitic affection; also in all acute or chronic inflammations of the meninges, whether due to the meningococcus, the tubercle bacillus, the pneumococcus, the streptococcus, or the influenza bacillus. In the early stage of poliomyelitis the reaction is also positive. In acute luetic meningitis

the presence of *Treponema pallidum* in the cerebrospinal fluid will serve to exclude other forms of meningitis.

In hydrocephalus, the cerebrospinal fluid gives a positive butyric-acid test in cases which are of syphilitic origin. In pneumonia, with an increased amount of cerebrospinal fluid without inflammation of the meninges, the fluid does not give a positive butyric-acid test.

The test is most valuable in differentiating between inflammatory and non-inflammatory conditions of the meninges in children. The blood-serum test is too complicated to be tried outside of a highly equipped laboratory.

Symptoms.—When catarrh is troublesome in children and not amenable to ordinary treatment, syphilis should be suspected. It is surprising to find the frequency with which nasal and nasopharyngeal catarrh is associated with syphilis. I have not yet had occasion to regret asking a direct question of a parent in whom I suspected syphilis, if such parent is told that we must know his previous history, for the benefit of his child.

Gastrointestinal Tract.—The gastrointestinal tract is the one that will frequently show the manifestations of syphilis. An infant will not appear to thrive nor will it digest, in spite of the most careful dietetic measures. Syphilitic lesions of the liver, pancreas, stomach, and intestine are simply all part of the infection. Anti-luetic treatment will frequently do more good in a few days or weeks than months of rigid diet. Thus it is apparent that in order to do good in this disease we must seek to remove the cause.

When a persistent diarrhea will not respond to the ordinary treatment of careful diet and medication, then suspect syphilis. When diarrhea such as a mucus-colitis persists without fever after careful dieting, then syphilis may be suspected.

The following case will illustrate congenital syphilis:—

An infant about one week old was seen by me. It was the fourth child of apparently healthy parents. Three children had previously died, and this fourth child was born at full term. The mother noticed that the child cried incessantly and was very restless. The child had had sniffles since birth. It was breast-fed and appeared to suffer with colic and hunger. The stools were grass-green and contained mucus and curds. The palms and soles had a pemphigus. The skin had a yellowish tinge. The nose was excoriated from the discharge. The anus had deep cracks—the so-called rhagades. Around the mouth were also rhagades. The spleen was enlarged and palpable. The lymph glands were not enlarged. The child did not seem to thrive. The finger nails showed distinct evidences of the disease. The bones

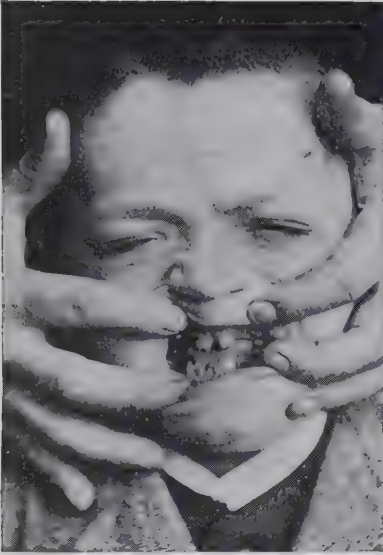


Fig. 203.



Fig. 204.

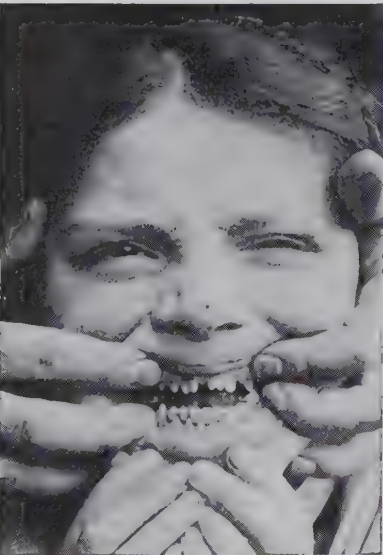


Fig. 205.

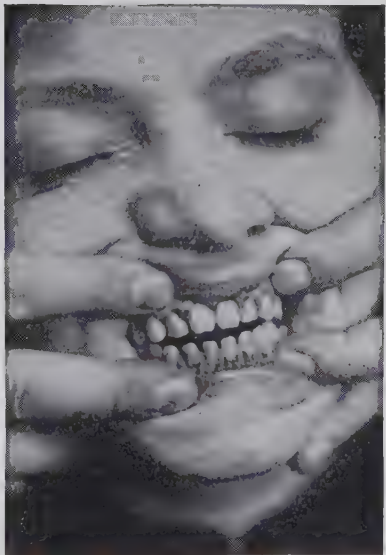


Fig. 206.

Figs. 203-206.—Syphilitic teeth. Various types of hereditary syphilitic teeth, as described by Hutchinson; also parenchymatous keratitis. Note that the upper central incisors show the positive evidence of syphilis. (*Hugo Neumann.*)

of the fingers and toes showed the presence of dactylitis syphilitica. The diagnosis of congenital syphilis was made. The mother had plenty of milk, but was compelled to wean the child owing to a typhoidal condition to which she succumbed. The infant was bottle-fed, and when about five weeks old developed a large abscess on the forearm which was incised under an anesthetic. One week later a series of metastatic abscesses formed over the abdomen and on the back. The child died from inanition and general sepsis when about nine weeks old.

Hemorrhages from the nose and mouth, and bloody stools due to ulceration of the intestinal tract are frequently reported.

Uracek has reported hemorrhages in the different internal organs caused by syphilis in the infant. Umbilical hemorrhages are sometimes due to syphilis.

Eruption.—The eruption consists of small, round, pink macules, which disappear on pressure. While the eruption may be on the abdomen and lower limbs, it not infrequently is found all over the body. At times the eruption resembles an erythema and is copper-colored. Sometimes the eruption is papular; it is not infrequent to find condylomata around the mouth or anus. These condylomata are very contagious. Pustules are frequently seen as early as two months. This eruption can be differentiated from eczema by the characteristic absence of itching that always accompanies eczema. Furuncles are usually found in poorly nourished children. The infant usually has a senile appearance.

The Teeth.—The teeth in congenital syphilis, instead of appearing at the sixth or seventh month, may not appear until the fourteenth or fifteenth month, and even later. These teeth are usually carious.

Congenital Syphilitic or Hutchinson's Teeth.—This variety of dental abnormality is important, because, as Hutchinson says, "It is, if taken alone, by far the most valuable of the signs by which we recognize in adolescence the effect of inherited syphilis." The characteristics of these teeth are not sufficiently known, and abnormal and peculiar teeth of other kinds are often erroneously regarded as proofs of congenital syphilis. The main points about "Hutchinson's teeth" are as follows:—

1. It is always the permanent teeth which are affected. The temporary teeth in syphilitic infants often decay early, but they present no special peculiarities of form.

2. The characteristic peculiarities which distinguish these central incisors are as follows: They are dwarfed, being too short

and too narrow; and sometimes the portion of the upper jaw from which they grow is also arrested in growth. They often stand somewhat apart and slope towards one another. They are unusually rounded on section; they are "pegged" and they are notched. The notch is usually shallow and the dentine is exposed at the bottom of it. It is formed by the breaking away of the imperfectly developed central portion of the edge. The teeth are generally not of a good color, and they are abnormally soft, so that by the time the patient is 20 they may be ground down like those of an old man.

The first molars are next in diagnostic importance to the upper central incisors. When characteristic they are spoken of as "dome-topped." Their sides slope toward the center, over which the enamel is defective. As might be expected, syphilitic teeth not infrequently present the characteristics of mercurial teeth in addition to their own peculiarities.

Diagnosis and Differential Diagnosis.¹—The clinical history will be the guide in congenital syphilis. The history of previous abortions, and still-born children will aid in establishing a diagnosis.

The cachectic skin, the wrinkled mouth, and rhagades at both mouth and anus will materially aid in establishing a diagnosis.

At times pseudo-paralysis will be present; sometimes coryza, hoarseness, inflamed eyes, and persistently running ears.

The Wassermann Reaction.—A positive Wassermann reaction be it +, ++, +++, or ++++ with symptoms of syphilis lends support to the diagnosis. Many cases of cachexia, and especially atrophic infants with gastroenteric symptoms, improve when small doses of calomel, $\frac{1}{20}$ to $\frac{1}{10}$ grain, are given three times a day for several weeks. Many of these cases give a negative Wassermann reaction. I have frequently examined the blood, three or four times, in intervals of one month, in infants sent to the Infantorium. These infants were admitted with a history of malnutrition and atrophy. Some of these cases improved when salvarsan or neosalvarsan was injected. Fordyce states that considerable variation exists in the Wassermann reaction in babies born of syphilitic mothers. The blood taken from the umbilical cord at the time of birth may be strongly positive, ten days later from the longitudinal sinus, jugular vein or

¹ See Blood in Syphilis, page 807.

veins of the forearm it may give a negative result. While for statistical purposes it is advisable to obtain blood at this time, one cannot place too much reliance on the result. In control cases we make several tests at ten day intervals; and if they continue negative in the absence of clinical evidence of the disease, we follow the child serologically for a year, lengthening the interval to from four to eight weeks. Careful clinical examination of these infants is also necessary as the blood is sometimes negative in the presence of the clinical infection, or it may fluctuate from negative to positive at different times.

Luetin Test.—This reaction devised by Noguchi is apparently specific for syphilis. It is useful after the spirochete can no longer be demonstrated, and when the *Treponema pallidum* still survives in the body. As a rule 90 per cent. of hereditary syphilis gives a positive reaction. Under 1 year the reaction is indistinct; from 2 to 6 years it gradually increases. Late cases are almost always positive. Exceptions are few. Cases with a strong Wassermann reaction and clinically unfavorable cases give a negative reaction.

An emulsion of pure culture of *Treponema pallidum* is prepared and 0.057 cubic centimeter is injected under the skin by means of a fine needle. If a red, indurated papule forms after twenty-eight to forty-eight hours, surrounded by a diffuse zone of redness, the reaction is positive.

This redness increases for three to four days, then disappears within a week. A slight rise of temperature may accompany this reaction.

The diagnosis between syphilis and rachitic bone lesions may become of great importance. Epiphyseal swellings occurring under six months are apt to be syphilitic. In syphilis the epiphyseal swelling may be unilateral, but it is always symmetric in rachitis. In doubtful cases the swelling must be subjected to specific treatment. Rickets and syphilis may coexist in the same case. There is almost invariably enlargement at the costochondral articulations in all cases of rickets, which is absent in syphilis.

Prognosis.—This depends upon the condition of the child at the time treatment is commenced. Such children have very little or no vitality.

Hereditary syphilis can be transmitted to healthy children, so that the precaution of strict isolation should be remembered.

TABLE NO. 60.—DIFFERENTIAL POINTS BETWEEN SYPHILIS AND TUBERCULOSIS.—(MORROW.)

SYPHILIS.

TUBERCULOSIS.

Exhibits a marked predilection for the long bones; its habitual localization is in the diaphysis and almost always at its terminal extremity.

There is a marked enlargement of the bone by more or less voluminous osseous tumors or hyperostoses, with little or no involvement of the soft parts.

There is little tendency to supuration and necrosis.

Osteocopic pains with tendency to nocturnal exacerbation are pronounced features.

The osseous lesions rarely react upon the general system.

In dactylitis there is little involvement of the soft parts, the swelling being caused by the enlargement in the size of the bone.

Is almost exclusively situated in the epiphysis, rarely affecting the shaft.

The tumefaction is due less to increase in the size of the bone than to edematous infiltration of the soft structures.

The pyogenic tendency is marked.

The pain is dull and heavy, not aggravated at night; sometimes there is entire absence of acute painful symptoms.

The osseous lesions often determine a marked impairment of the general health, grave complications, hectic fever, cachexia, etc.

In dactylitis the swelling is due more to an edematous infiltrated condition of the soft tissues than to enlargement of the bone. Breaking-down of the tissues and ulceration are more apt to ensue.

Treatment.—While the longitudinal sinus in the hands of an experienced physician offers a rapid means of disseminating the neo-arsphenamin, harm can be done by an inexperienced operator. For the general practitioner I would advise the method used at the Vanderbilt Clinic by Fordyce and Rosen which consists in the injection of the required dose into the gluteal muscle.

In the method in question, neo-arsphenamin and mercury are used intramuscularly with a special needle to insure the proper location of the drugs in the gluteal muscles. If the infant is very much underweight with a proper musculature, mercury alone is given at weekly or bi-weekly intervals until there is an improvement in the general condition, after which the injections of neo-arsphenamin are begun.

The mercurial employed is the mercuric chlorid put up in palmatin in individual collapsible ampules in doses of from $\frac{1}{10}$ to $\frac{1}{8}$ grain or larger for older children. The object in giving a soluble mercury in oil is to favor slow absorption of the drug.

In this form it requires about three or four days for absorption. The palmitin, which is in colloidal state, is semi-solid at room temperature and liquefies at 110° F. When ready for use, the



Fig. 207.—Appearance of patient with mucous patches and ulcerations about the mouth and anus, squamous syphilid on face and body, and marked snuffles. (*Fordyce and Rosen.*)

syringe being still warm after its removal from the sterilizer, the contents of the ampule are expressed into the barrel, all the air removed, and if the oil has not liquefied from its contact with

the hot syringe, the latter with the drug may be immersed for a minute in hot water.

An ordinary mercury needle of from 19 to 20 gauge, cut down



Fig. 208.—Appearance of patient three weeks after treatment.
(*Fordyce and Rosen.*)

to from one-half to one inch in length, is used. After the buttock has been sterilized with iodine, the injection is given into the muscle about one inch from the intergluteal fold near its upper angle. The chief pain is that induced by the prick of the

needle, as the children as a rule stop crying as soon as the treatment is completed.

In this way we are giving a definite dose of mercury to our patients and need not depend on an unintelligent mother for rubbing in an ointment, the amount of absorption of which varies in every case owing to differences in quality, strength, and the length of time the child is rubbed.

As compared with aqueous solutions of mercuric chlorid larger doses can be employed with an oily menstruum, absorption is



Fig. 209.—Congenital syphilis before injection of neosalvarsan.

less rapid, and the attendant pain of the injections not so great. The slower absorption permits longer intervals between injections. At present we are giving from six to eight treatments at weekly intervals, followed by a rest period of from four to six weeks.

The neo-arsphenamin is put up in individual glass ampules containing from 0.1 to 0.2 of a gram and large enough to hold 5 cubic centimeters of solution, the object being to dissolve the drug in the original container. After the ampule has been immersed in alcohol to insure its proper sealing and sterilization it is dried with sterile gauze, the end broken off, and from 2.5 to 3 cubic centimeters of cool, sterile, freshly distilled water injected into it by means of a syringe. We then attach to the latter a Luer mercury needle

long enough to reach to the bottom of the ampule and draw the fluid into the barrel, alternately expelling and drawing it up to hasten complete solution.

The complications following the intramuscular injection of neoarsphenamin, such as abscesses and infiltrations, can be avoided if the drug is injected deep into the muscle. To prevent its leaking into the subcutaneous and adipose tissue, there has been devised a special needle from $\frac{1}{2}$ to 1 inch in length (somewhat longer for

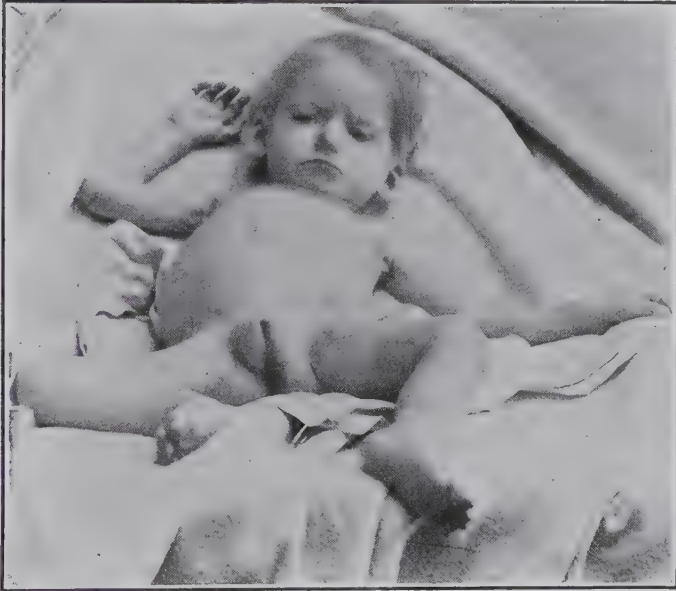


Fig. 210.—Appearance of lesions one week after injection of neosalvarsan.

older children) of 19 to 20 gauge, with an oval concave shoulder which fits snugly over the buttock, the shank of the needle being inserted flush with the under surface of the concavity. This enables the operator to hold the needle in place, no matter how much the child moves. With the ordinary needle the slightest motion of the child changes its position, and unless the operator watches this carefully he injects the drugs into the subcutaneous and adipose tissue with unpleasant by-effects. After the injection, the needle is rapidly withdrawn and a cotton pledget held firmly over the site for a few minutes. The site of injection is

the same as for the mercurial treatment. Half of the solution is injected into each buttock previously cleansed with tincture of iodine.

More recently silver salvarsan has been used by Toepffer.¹ Infants were given 0.015 grain per kilog. silver salvarsan.²

There is a slight reaction noticed on the first day, with loss of appetite. No fever was noted in a series of 50 cases. The injections were given intravenously by Mengert of Dresden, whereas Stern of Dusseldorf prefers the intramuscular method.

From what little experience I have had, and cases that have been followed for several months the results are far better than those formerly noted with neosalvarsan. In all, five to seven injections were given in intervals of one to two weeks.

No case should be injected with neosalvarsan until a positive Wassermann reaction has been obtained. The choice of the technic of the injection is one of preference. The following doses are recommended: For an infant 1 year old, an injection of 0.06 gram, to be followed in one week by an injection of 0.1 gram if no severe systemic reaction follows the first injection. For a child 5 years old an injection of 0.1 gram, followed one week later by an injection of 0.2 gram. Complications must be guarded against.

B. L., 6 years old, was admitted to the babies' ward of the Sydenham Hospital. The mother had an innocent infection. The child showed distinct evidences of syphilis. Two years previous a gumma of the left testicle existed, and said testicle was removed. At time of admission he had very marked superficial veins, periostitis, and gumma of the left knee-joint. The Wassermann reaction and the Noguchi reaction were positive.

One injection of 0.3 gram of salvarsan, in a neutral solution, was given, with aseptic precautions, in the left buttock. No local reaction followed. The child made a brilliant recovery. The swelling in joint subsided after three days. The boy walked in one week and was discharged two weeks after admission.

¹ TOEPFFER: München. med. Wchnschr., 1920, Nr. 28.

² STERN, C.: Intramuscular Injections of Silver Arsephenamin, Mün. med. Wchnschr., 67, 28, 806 (July 9, 1920), J. A. M. A., 75, 16, 1101 (October 16, 1920).

All salvarsan and neosalvarsan used at the Willard Parker Hospital was furnished by the courtesy of the H. A. Metz Laboratories.

XVI.

ACUTE RHEUMATISM (RHEUMATIC FEVER, POLYARTHRITIS).

RHEUMATISM is an acute infection characterized by fever. It is infectious but non-contagious. The point of entrance is supposed to be the tonsil, as tonsillitis is a forerunner of many cases of acute rheumatism.

Etiology.—The specific factor is evidently a micro-organism. A great many observers have studied this subject, among them, Leyden, Sahli, Achalme, Riva, Triboubet, Coyon, Singer, Jaccoud, and many others. A bacillus described as an anaërobe, with more or less motility, similar to the anthrax bacillus, has been described by Achalme. This bacillus, when injected into animals, has reproduced symptoms resembling rheumatism. Thus this observer believes he has found the specific agent causing this disease.

Modern views concerning the etiological factors causing this disease point to infected teeth and tonsils as the most important agents.

The Teeth.—Suppurative conditions such as alveolar abscess or dental infections associated with carious teeth are the etiological factors in many cases of rheumatism. In all cases of rheumatism, therefore, an x-ray examination of the teeth should be made.

Suppurating gums and decayed teeth are recognized as a source of systemic infection, toxic symptoms resulting therefrom will disappear when proper treatment of the teeth and gums is instituted.

Sinus infections and glandular infections have been traced to diseased teeth. Detoxication in such cases is impossible until the source of the infection is removed.

If the hands are swollen and tender, and persist for a long time, then a Wassermann should be taken to exclude syphilis.

Other causes have been described as the result of defective assimilation, which produces lactic acid or combinations of it. Another theory is the so-called *nervous theory*, in which the nerve centers are primarily affected by cold, and the local lesions are atrophic in character.

This nervous disturbance brings about faulty metabolism, so that the nitrogenous products, instead of being converted into urea, are transformed into uric acid and other poisonous products which cause these symptoms.

Whether or not heredity bears any relationship to the cause of this disease may be considered by the fact that in two-thirds of the cases, diseases of a similar type can be traced to the ancestors. Gouty parents will usually have rheumatic children. The disease is very common in children, and has also been observed in nurslings.

Rheumatism occurs more often in the spring of the year. When the disease has commenced, it usually lays the foundation for future attacks; in other words, one attack of rheumatism predisposes to future attacks of the disease.

Bacteriology.—Triboulet and Coyon give the results of their bacteriologic examinations in 11 cases of acute articular rheumatism. They discovered in all these cases a diplococcus or diplobacillus which they state cannot be well described as to its cultural peculiarities, as its growth is so irregular.

The organism exhibits great plesiomorphism and resembles most closely in character the diplococcus pneumoniae, but differs from it in that it can be kept alive for a considerable length of time, and that it is not pathogenic for mice. The organism is extremely pathogenic for rabbits, and the authors give a detailed account of its effects on a rabbit. The animal died twenty days after intravenous inoculation. Death was due to heart failure resulting from an absolute mitral insufficiency. During life there was an oscillatory temperature. The autopsy showed fresh pleuritis and pericarditis, and an acute vegetative endocarditis with tremendous masses of vegetations on the mitral valve. The vegetations microscopically showed many diplobacilli similar to those originally inoculated, and cultures from the organs also showed them. Other rabbits inoculated with smaller doses from other cases showed irregular fever, disturbances of the heart, and pleurisy, but did not die.

Symptoms.—The symptoms are entirely different from those met with in adults. The fever is not so high, usually between 100° and 102° F. The swelling of the joints is moderate, and there is redness and inflammation visible to the eye as we see it in adults. The pains are not severe in all cases, and there are fewer joints involved as a rule than we find in adults. We there-

fore meet with a great many cases of rheumatism that walk around suffering slight pains. Sometimes the lower extremities are affected, at other times the disease is limited to the upper extremities. A child may walk apparently lame or an infant may cry when put on its feet. Jacobi years ago directed the attention of the profession to the necessity of carefully watching every case of so-called "growing pains." He believed, and correctly so, that the majority of these cases were in reality rheumatism. The most frequent symptoms are vomiting, fever, general malaise, anorexia, in addition to multiple arthropathy.

Tonsillitis no matter how slight should be carefully observed. The frequent occurrence of rheumatism as a sequela should be remembered. An eruption of a deep purplish color, resembling purpura, is frequently seen in rheumatism. It is called *peliosis rheumatica*. It resembles small subcutaneous hemorrhages.

The inflammation travels from joint to joint.

Complications.—The most frequent form of complication is endocarditis.

Pericarditis is rarely seen in children under 7 years of age. It is usually associated with endocarditis.

Pleurisy, peritonitis, or meningitis may complicate rheumatism. Chorea frequently associates itself with rheumatism, so that a great many authors believe that there is an intimate relationship between rheumatism and chorea.

Holt states that in a series of cases of chorea observed by him, 56 per cent. gave evidence of the rheumatic diathesis.

Prognosis and Course.—Rheumatism in children assumes the course of a general infectious malady. The intensity of cardiac complications cannot be approximated by the intensity or mildness of articular manifestations. Many authorities state that the percentage of cardiac complications is between 81 and 87 per cent. Fully 75 per cent. of my cases met with in a large outdoor practice showed this form of complication. This complication has frequently been the first symptom that led to the discovery that our patient had rheumatism.

Lethal termination will frequently show pericarditis, hence the important deduction is to prevent such complications, if possible, by proper prophylactic treatment.

Pains in the joints should never be regarded as a trivial matter. Frequently we see a child suffering with what the mother

calls "growing pains," and a few weeks or months later we note shortness of breath due to heart trouble, usually endocarditis.

It is *better to put a child to bed* than to run the risk of such a serious complication. The prognosis depends upon the care bestowed, although we know that this disease has a tendency to assume a chronic course. However, a case with proper treatment should recover entirely. The inflammatory stage lasts from ten days to two weeks. Cases of inflammatory rheumatism complicating scarlet fever or diphtheria lasting between three and eight weeks have been seen by me during my hospital service.

Treatment.—*Local:* If we are dealing with a very painful joint then a prolonged tub-bath, temperature of 100 to 103° F, duration fifteen to twenty minutes, is very soothing. In some cases an ice-bag may relieve acute pain and reduce swelling. If the heat is well-borne then sulphur added to a hot bath, or pine needle oil or ichthyol may have a psychic influence on the patient but it is the heat that gives relief.

Local applications such as gauze saturated with warm alcohol containing 1 per cent. of menthol is soothing. The gauze should be covered with oiled silk to retain the heat. Gauze saturated with oil of wintergreen and applied over the joint will also relieve tenderness.

Internal.—Salines such as Rochelle salts in teaspoonful doses can be added to lemonade and given several times a day. Salol or salicylate of soda in 2 to 5 grain doses can be given every three hours by day. Codein $\frac{1}{10}$ to $\frac{1}{5}$ grain may be given at night and repeated every three hours to relieve pain and promote sleep. Aspirin or novatophan in 3 to 5 grain doses may be given every three hours. Great care should be taken in continuing these drugs for a long time as they are one and all cardiac depressants. When relief from pain is attained all drugs should be discontinued. Fever if present requires no special treatment.

Feeding.—Liquid food such as thin gruels or milk and seltzer and especially vegetables should be ordered. The bulk of the diet, however, should be milk.

PART VIII.

Diseases of the Blood, Glands or Lymph Nodes, and Ductless Glands.

I.

INTRODUCTORY.

THE BLOOD.

THE red corpuscles (erythrocytes). The red corpuscles of the blood are more numerous at birth than in later life. Hayem and Helot found that when the umbilical cord was not tied until its pulsations ceased, a greater number of red corpuscles were found than in cases where immediate ligation was performed. Leder and Hutchinson, comparing the new infant's blood with that of its mother, found that the blood of the infant contained a larger number of red corpuscles. The following table will show the difference in blood count by various writers:—

TABLE No. 61.

| | | |
|------------------------------|----------|-----------|
| Hayem | averaged | 5,360,000 |
| Sörensen | " | 5,665,000 |
| Otto | " | 6,165,000 |
| Gundobin | " | 6,700,000 |
| Elder and Hutchinson | " | 5,346,560 |
| Schwinger greatest at birth. | | |

As can readily be seen, from the above table, the counts vary considerably; but all are above a normal adult count. The differences are probably due to the time of day the counts were made, and whether or not they followed or preceded feeding time. Gundobin believed that the concentration of the blood was caused by loss of water through the lungs. Schiff found the same condition; he also states that the number of corpuscles decreases when the child is put to the breast. The number of red corpuscles begins to fall after the second day.

In one case Schiff studied the number in the morning and evening during the first fifteen days of life; he found the number declined

irregularly. The first day's count was 7,628,000; the last day's count was 4,565,600; the average for the fifteen days was 5,828,465.

According to Schwinger and Gundobin, there is a decrease in the number during the first year; after this there is an increase up to the eighth or twelfth year, when the number becomes approximately that of adult life. Sex makes no difference in the count of the red corpuscles in infancy.

Size.—The red corpuscles vary greatly in size at birth and during the first few days of life. Hayem found variations between $3.25\ \mu$ and $10.25\ \mu$ and Loos found the size varying from $3.3\ \mu$ to $10.3\ \mu$. Gundobin claims that the hemoglobin is more firmly attached to the cell stroma in the new-born infant. He also calls attention to the great number of small-sized corpuscles.

The Hemoglobin.—According to Morse, Elder, Hutchinson, Taylor, and Rotch, hemoglobin is increased at birth, but the percentage declines rapidly during the first few days of life. According to Rieder, there is an excess of 25 to 30 per cent. at birth compared with infants after feeding has begun.

Specific Gravity.—This varies just like the hemoglobin. At birth the specific gravity is high.

| | |
|---|------|
| Monti found the specific gravity at birth | 1060 |
| Rotch found the specific gravity at birth | 1065 |
| Hoch and Schlesinger found the specific gravity at birth. | 1066 |
| Moelle found the specific gravity at birth | 1060 |

The specific gravity may not vary for weeks or months in healthy children.

The White Blood Corpuscles (Leucocytes).—Leucocytes are found in greater number at birth than in later life. This excess in number is a normal condition. It is also called *the physiological leucocytosis of the new-born*.

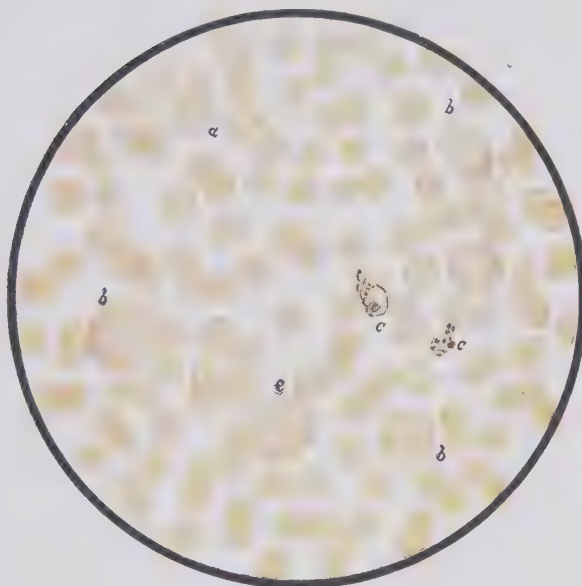
TABLE No. 62.

| <i>Physiological Leucocytosis.</i> | <i>Pathological Leucocytosis.</i> |
|---|--|
| 1. Leucocytosis of the newly born. | 1. Inflammatory and infectious leucocytosis. |
| 2. Digestion leucocytosis. | 2. Leucocytosis of malignant disease. |
| 3. Leucocytosis due to mechanical influences. | 3. Toxic leucocytosis. |
| 4. Thermal leucocytosis. | 4. Experimental leucocytosis. |

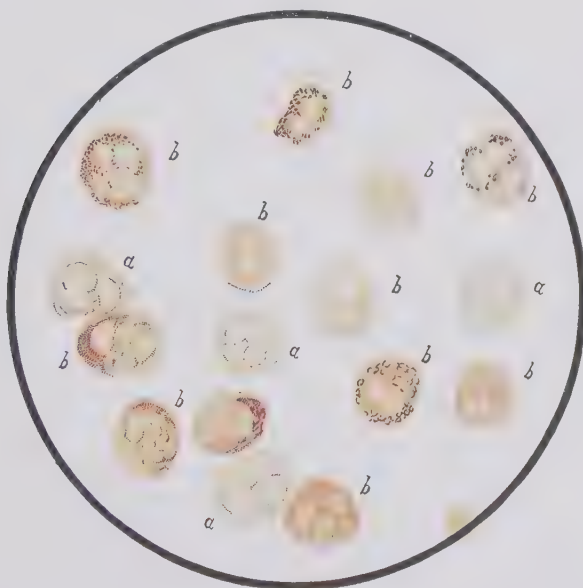
Leucocytosis.—There is an increase in both the polynuclear cells and lymphocytes in infancy. Upon making a differential

PLATE LVII

IODOPHILIA. PUS REACTION OF BLOOD.



Coverglass specimen of blood in a case of suppurative appendicitis. *a*, polynuclear leucocytes; *b*, polynuclear leucocytes containing many irregular granules of glycogen; *c*, extra-cellular iodine-stained masses, giving the reaction of glycogen.



a, pus corpuscles without iodine reaction; *b*, pus corpuscles, iodine reaction.

count the lymphocytes will be found to be relatively increased, sometimes as high as 50 per cent. of the total leucocyte count.

TABLE No. 63.

| | <i>Red blood-corpuscles.</i> | <i>Leucocytes.</i> |
|-------------------|------------------------------|--------------------|
| Birth | 5,900,000 | 21,000 |
| Seventh day | 5,000,000 | 15,000 |
| First year | 5,000,000 | 10,000 |
| Sixth year | 5,000,000 | 7,500 |
| | | (Coles.) |

Proportion of Leucocytes in Adults and Infants.

| | <i>Adults.</i> | <i>Infants.</i> |
|--------------------------------|--------------------|--------------------|
| Small uninucleated | 24 to 30 per cent. | 50 to 75 per cent. |
| Large uninucleated | 3 to 6 per cent. | 6 to 14 per cent. |
| Multinucleated or neutrophile. | 60 to 75 per cent. | 28 to 40 per cent. |
| Eosinophile cells | 1 to 2 per cent. | ½ to 10 per cent. |

Pathological Conditions.—In disease the first change noticed will be a reduction in the percentage of hemoglobin, and also in the number of erythrocytes.

Nucleated Red Corpuscles (Erythroblasts).—These cells have been found in primary and secondary anemias by many observers. They have also been found very abundant in syphilis, rachitis, tuberculosis, pseudoleukemia, and osteomyelitis.

Infectious Diseases.—In diphtheria, scarlatina, rheumatic fever, meningitis and erysipelas the polymorphonuclear cells are greatly increased. Gundobin found an increase in the number of leucocytes before the eruption in scarlet fever, measles, and erysipelas. In typhoid fever the number of leucocytes is decreased: there may be also a decrease in the number of red corpuscles and in the percentage of hemoglobin. The number of leucocytes is relatively increased. The polymorphonuclear cells are decreased.

Pneumonia.—Leucocytosis is usually present in this disease. When it is absent the prognosis is grave.

Syphilis.—In hereditary syphilis an anemia is found with a decrease of the red corpuscles and great degenerative changes (poikilocytosis). In syphilis we find microcytes and macrocytes and nucleated erythrocytes. Myelocytes are also found. Eosinophiles are also met with in this condition.

Bronchitis.—A slight leucocytosis with especial increase of the lymphocytes or mononuclear cells is found in bronchitis.

Gastrointestinal Disease.—The condition of the blood varies according to the extent of the process, the duration, and the exist-

ence or non-existence of diarrhea and vomiting. Profuse diarrhea and vomiting may for a time thicken the blood by loss of water. Weiss shows an increase of the leucocytes and transitional leucocytes.

Acute colitis causes concentration of blood, with considerable leucocytosis.

Inflammatory leucocytosis is classified, according to Cabot, as follows:—

1. Infection mild; resistance good; small leucocytosis.
2. Infection less; mild; resistance good; moderate leucocytosis.
3. Infection severe; resistance good; very moderate leucocytosis.
4. Infection severe; resistance poor; no leucocytosis.

Rachitis.—There is usually a reduction in the number of red corpuscles, a decrease in the percentage of hemoglobin, and an accompanying leucocytosis according to von Jaksch.

Skin Diseases.—There is an increase in the number of eosinophiles. The cause of the same is unknown.

Nervous Diseases.—In the functional disorders of childhood the blood findings are those of a moderate anemia. Burr has found that the blood in chorea is not as a rule anemic. In my own examinations the opposite result has been found, and in prolonged chorea a distinct leucocytosis occurs.

Lymphocytosis.—This is frequently seen in the anemias, in tuberculosis, in syphilis, in pertussis, and in the acute intestinal disorders of childhood. It also occurs in an extreme degree in lymphatic leukemia.

Eosinophilia.—In bronchial asthma, scarlatina, skin diseases, trichinosis, and other parasitic diseases, eosinophilia is encountered.

Leucopenia.—A marked reduction in the normal white cell count from 8000 to 4000 or lower occurs in typhoid fever. In some toxic cases the leucocyte count may be as low as 2000. This never occurs in meningitis. As a rule the leucocyte count in meningitis is above 10,000 and may be as high as 18,000 to 20,000, and is an important point in the differential diagnosis of these two conditions.

Blood Reaction of Pus.—The glycogenic reaction of the blood has frequently been described in literature. The first complete paper on this subject was published by Goldberger and Weiss.¹ This diagnostic aid is of value when a questionable diagnosis exists.

¹ Wiener klin. Wchnschr., No. 25, 1897.

When an abscess exists, especially if it is localized, there is invariably a marked leucocytosis, even in limited suppurative foci. In the subcutaneous or interstitial connective tissue there is always a high leucocytosis. Ewing found marked leucocytosis in the active stages of otitis and all suppurative processes which subsided rapidly after the operation. There was one exception in abscess of the liver with mucopurulent exudate.

Iodine Reaction (Iodophilia).—This reaction consists in slight or intense reddish-brown granules and a diffuse brown coloring of the entire protoplasm. The protoplasm of the polynuclear neutrophile leucocytes shows a marked affinity for iodine. This intracellular iodine reaction is present in purulent conditions and persists as long as suppuration is present. It has an important diagnostic bearing when abscesses are deep seated. Cabot and Locke² obtained uniformly positive reactions in septicemia, pneumonia, empyema, and suppurative appendicitis; in serous pleural effusions and in catarrhal appendicitis the test was negative. In about one-half of the cases of enteric fever examined by these writers the test was positive, usually, only in those complicated by hemorrhage, perforation, furunculosis, or lung lesions. These studies have been substantiated by Gulland.³

TABLE No. 64.

Iodine Reaction

| <i>Reaction Present in</i> | <i>Reaction Absent in</i> |
|--|-----------------------------------|
| Empyema. | Serous pleural effusion. |
| Suppurative appendicitis. | Catarrhal appendicitis. |
| Enteric fever when complicated by furunculosis or pulmonary lesions. | Enteric fever when uncomplicated. |
| Gonorrheal arthritis. | Rheumatic arthritis. |
| Influenza. | Pure tuberculous abscesses. |
| Cerebrospinal meningitis. | |
| Sepsis (septicemia). | |

The persistence of this reaction after the incision of a pus cavity suggests, frequently, imperfect drainage.

The following table, prepared by Casper Sharpless, will assist in the differentiation of the blood:—

² Journal of Medical Research, 1902, vol. vii.

³ British Medical Journal, 1904, vol. i.

TABLE No. 65.

| Disease. | Leucocytosis. | Lymphocytes. | Neutrophiles. | Red Cells. | Hemoglobin. |
|------------------------------|---------------------|----------------------|---------------|--------------------|---------------------------|
| Typhoid fever | Absent | Relatively increased | Decreased | Decreased | Proportionately decreased |
| Typhoid with complications . | Present | | Increased | Decreased | Proportionately decreased |
| Scarlet fever | Present | Decreased | Increased | Decreased | Proportionately decreased |
| Measles | Absent | | | No change | No change |
| Small pox.. | Marked on third day | | Increased | Much decreased | Proportionately decreased |
| Erysipelas .. | Marked | | Increased | Decreased | Proportionately decreased |
| Diphtheria . | Marked | Rarely increased | Increased | Slight decrease | Proportionately decreased |
| Influenza .. | No change | | | No change | No change |
| Typhus fever | No change | | | No change | No change |
| Follicular tonsillitis . | Moderate | | | No change | |
| Acute rheumatism .. | Moderate | | Increased | Markedly decreased | Markedly decreased |
| Septicemia . | Marked | | Increased | Marked decreased | Proportionately decreased |
| Abscess | Marked | | Increased | Decreased | Proportionately decreased |
| Meningitis . | Marked | | Increased | Slightly decreased | Proportionately decreased |
| Peritonitis . | Marked | | Increased | Slightly decreased | Proportionately decreased |
| Pericarditis. | Marked | | Increased | Slightly decreased | Proportionately decreased |
| Pleurisy ... | Marked | | Increased | Slightly decreased | Proportionately decreased |
| Malaria | Absent | Relatively increased | Decreased | Decreased | Proportionately decreased |
| Pneumonia ¹ . | Marked | Decreased | Increased | Decreased | Proportionately decreased |
| Appendicitis. | Marked | Marked | | | |

¹ In pneumonia there is a decrease of the eosinophiles and in scarlet fever an increase.

The staining solution as advised by Goldberger and Weiss is as follows:—

| | |
|--|-------|
| Iodin | 1.0 |
| Potassium iodid | 3.0 |
| Distilled water | 100.0 |
| Mix and add sufficient gum arabic (about 50 parts) to make a syrupy mixture. | |

With a camel's-hair brush a layer of this solution is painted over the surface of the dried unfixed blood film, upon which it is allowed to act for from one to five minutes. The excess is then removed by blotting with a bit of filter paper, and the specimen is mounted in cedar oil. Or, as Wolff advises, Zollikofer's method may be used: placing the fresh film for a few minutes in a stoppered bottle containing crystals of pure iodine. In films thus treated the iodine reaction is recognized by a slight or intense, diffuse brown coloring of the entire protoplasm, or by the presence throughout the protoplasm of numerous intensely stained, reddish-brown granules, the latter change being the more common. In normal blood the protoplasm of the leucocytes is stained a pale yellow and the nuclei remain almost colorless.

Antibacterial Action of the Blood.—According to Halliburton, the power of the blood to destroy bacteria was first discovered when an effort was made to grow various kinds of bacteria in it; the blood was believed to be a suitable soil for this purpose, but it was found to have the opposite effect in many instances. The chemical characters of the substances which kill the bacteria are not fully known. Evidence appears to favor the leucocytes as the origin of this bactericidal substance. These substances are called alexins, But the more usual name now applied to them is that of bacteriolysins. The bactericidal power of the blood is closely related to its alkalinity. Increase of alkalinity means increase of bactericidal power. Alkalinity is probably beneficial, because it favors those oxidative processes in the cells of the body which are so essential for the maintenance of healthy life. Normal blood possesses a certain amount of substances which are inimical to the life of bacteria. When a person gets run down there is a diminution in the bactericidal power of his blood. However, a perfectly healthy person has not an unlimited supply of bacteriolysin, and, if the bacteria are sufficiently numerous, he will fall a victim to the disease which they produce. In the struggle he will form more and more bacteriolysin, and if he gets well, it means that the bacteria are vanquished, and his blood

remains rich in the particular bacteriolysin he has produced, and so will render him immune to further attacks from that particular species of bacterium. Every bacterium seems to cause the development of a specific bacteriolysin. Immunity can more conveniently be produced gradually in animals, and this applies, not only to the bacteria, but also to the toxins they form.

The Blood in Fever.—There is a decided reduction in the number of red cells during fever. Whether the fever destroys the red cells or causes them to be unequally distributed in the body is a question. Maragliano demonstrated a contraction of arterioles during the height of a febrile process, followed by dilatation during defervescence. He was able to verify these results by noting the effect of antipyretics (Ewing).

Salkowski demonstrated an excess of potassium in the blood during fever, thus favoring the view that the red cells are destroyed. Senator, von Jaksch, and others have shown that febrile processes are regularly marked by diminished alkalescence of the blood. When diphtheria antitoxin is injected, the alkalinity of the blood is increased for about twenty-four hours.

The progressive *loss of albumin* is probably associated with every fever, but occurs in a marked degree when the fever is of an infectious origin. Diminished resistance of the red cells occurs in the majority of fevers and depends on a variety of factors. Variations in alkalinity are frequent and considerable in fever, but are not proportional to either the toxicity or to the height of the temperature (Ewing).

Almost all micro-organisms which are harmful to the body raise its temperature. The suggestion has been made that the rise of temperature is a defensive mechanism, or, in other words, pyrexia is like phagocytosis or chemotaxis, in some way harmful to the fever-producing micro-organisms or their toxins. It does not follow from this view that the higher the temperature of the body the better the prognosis, for the higher temperature might be taken to indicate that the dose of infection was very severe, and that, therefore, the body did all it could to resist the invasion; nor, on the other hand, would it follow that if the temperature did not rise much, the dose of infection was slight, for it might be that the body was feeble and had but little power of raising its temperature, and therefore defending itself.

It is *generally believed*, and in all probability correctly, that many cases of typhoid fever are benefited by cold sponging or by a cool

bath. Many have hastily concluded that the bath does good because it lowers the temperature. But this is probably incorrect. In the first place we must remember that the cold sponging or bath does more than lower the temperature; it diminishes the delirium, the tremor, and the prostration. In any of these ways it would do good. But, further, Roque and Weil claim to have shown that in typhoid fever left to itself the toxic products manufactured by the bacillus and organism are eliminated in part during the illness. The urotoxic coefficient is double the normal, but this elimination is incomplete and is only completed during convalescence, for the hypertoxicity continues for four or five weeks after the cessation of the fever. In typhoid treated by cold baths, the elimination of toxic products is enormous during the illness. The hypertoxicity diminishes as the general symptoms mend and as the temperature falls, so that when the period of pyrexia and convalescence sets in the elimination of toxins has ceased. So we learn that it is by no means certain that in typhoid fever the benefit of cold baths is due to their antipyretic influence alone, but also to the elimination of toxins.

II.

DISEASES OF THE BLOOD.

ANEMIA.

A DEFICIENCY in the number of red blood-cells or of the hemoglobin is known as anemia. As a rule there are two distinct forms: first, congenital; second, acquired.

Congenital Form.—The fetus in utero is frequently anemic owing to the condition of its mother. Syphilis, or where a general devitalization occurs as in tuberculosis, may cause anemia in the fetus. If the mother while pregnant passes through a severe form of diphtheria, typhoid fever, or any other infectious disease, it may result in anemia of her offspring.

Malarial infection of the mother may also result in an anemia of the baby. A severe hemorrhage due to an operation on the mother during the last period of her pregnancy may cause an anemia of the baby.

Acquired Form.—This form is due either to an infection of the baby or to toxic conditions acquired after birth and independent of the mother. Most cases of acquired anemia seen by me are the direct result of malnutrition. I have referred in detail to this condition in the chapter on Scurvy and Rachitis.

BANT'S DISEASE (SPLENOMEGALIC CIRRHOSIS OF LIVER).

The characteristic features of this disease consist in progressive enlargement of the spleen, later in the disease cirrhosis of the liver with ascites and jaundice. It is usually an asthenic condition.

Etiology.—There are several views of origin:

- (1) That it is an ordinary cirrhosis of the liver with secondary changes in the spleen.
- (2) That the anemia is the primary condition with resulting secondary cirrhotic changes in the liver and the spleen.
- (3) That it is a form of congenital lues.
- (4) (Most probable) that it is some intestinal or gastric intoxication that causes splenitis.

Pathology.—In the spleen there is a dilatation of the sinuses and an increase of the spindle cells in the cords with atrophy of parenchyma together with a proliferation of the endothelial cells.

The Malpighian bodies show degenerating or necrotic cells. As the disease progresses the liver cirrhosis becomes prominent, and ascites and progressive involvement of the spleen result in a fatal termination.

Symptoms.—As a result of hemorrhages, such as hematemesis or intestinal bleeding, there is a secondary anemia. Bleeding may not only be confined to the stomach and bowels, but it may also be due to gastric erosions or varicose veins in the esophagus. In some cases the gums will bleed. There is usually jaundice because of the cirrhosis of the liver, associated therewith anorexia. Constipation or diarrhea may be present. The examination of the blood shows nothing definite excepting a leucopenia and a relative lymphocytosis. There is also a hemic murmur which is systolic. The slightest exertion will be followed by tachycardia. The urine may contain albumin, but no casts, although blood and pus cells have been found. The temperature is rarely above 100° F. in the evening, and is usually about 99° in the morning. A marked pallor of the skin exists and there is a gradual loss of weight.

Course.—The course is chronic and may progress from two to ten years.

Diagnosis.—Banti's disease must be differentiated from Gaucher's disease, from cirrhosis of the liver (syphilitic), from splenomegaly in pernicious anemia, from leukemia, or from any other disease in which there is an enlarged spleen.

Treatment.—Splenectomy has recently been advocated and offers some hope. Efforts should be made to improve the blood condition, with iron and arsenic before the operation. In advanced cases operation is contraindicated.

SPLENIC ANEMIA.

This condition differs from Banti's disease in that it is a blood disease occurring as the result of over function of the spleen in removing increased numbers of red blood cells. In some instances the spleen takes over blood formation and this further increases its size.

Treatment.—There has been little success, to date, in the treatment of splenic anemia.

SECONDARY ANEMIA.

Causes.—Toxic influences frequently destroy the blood corpuscles and also the hemoglobin, hence anemia results. When hemorrhage takes place then anemia frequently follows. Malaria and whooping-cough seem to affect children more than adults. Other diseases, such as rheumatism and endocarditis, in fact most of the acute infectious diseases, seem to cause anemia in children sooner than in adults. Improper hygiene, and more frequently improper food, should not be overlooked as causative factors.

If an exclusive milk diet is fed to a child over one year old, without the addition of vegetables or meat juices a secondary anemia is liable to occur.

Symptoms.—A pale white skin and waxy appearance of the nails is the usual clinical picture. Children do not appear bright. They take no interest in their surroundings, and do not wish to play. Loss of appetite and tendency to constipation frequently exist.

Diagnosis.—This is usually determined by the condition of the blood.

Prognosis.—The origin of the anemia should be the guide in determining the outcome of this condition. A cautious prognosis should always be given, unless we are sure of the origin and can remove the cause of same.

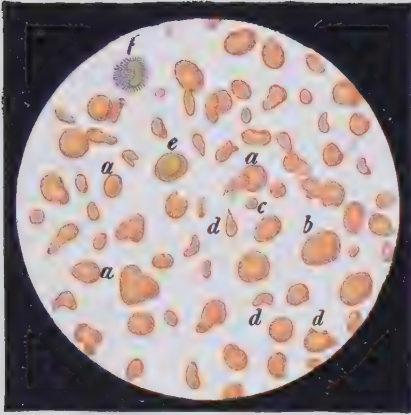
Treatment.—Restoratives such as codliver oil, iron in the form of Blaud's pills, or in soluble form, Fowler's solution, and malt preparations, are indicated. Transfusion when possible is the most logical therapeutic agent. When this is impossible then the cacodylate of soda may be tried hypodermically. Inhalations of oxygen have been suggested. The most important agent is food: Eggs, steak-juice, peptonized milk, protein milk, and vegetables and fruit juices, instead of water.

PERNICIOUS ANEMIA.

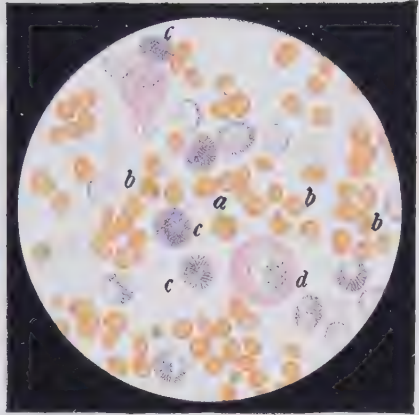
Definition.—A recurring and fatal anemia caused by hemolytic agents and characterized by the appearance in the blood of embryonal types of cells. This condition was first described by Addison and subsequently by Biermer.

Etiology.—There is little doubt that this is a secondary condition, but at present we must consider it as a primary idiopathic

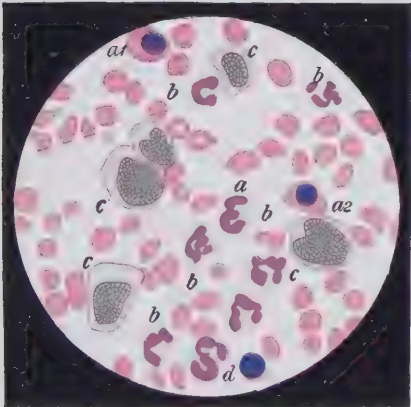
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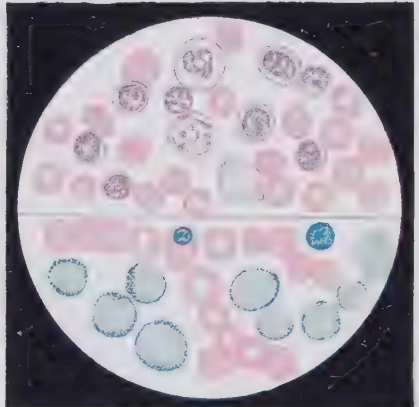
A



B



C



D

A.—Progressive pernicious anemia. The case ended fatally in six weeks; cause unknown; possibly in connection with typhoid fever. Ehrlich's triacid stain. Zeiss ocular 1, oil immersion $\frac{1}{12}$. *a*, normal erythrocytes; *b*, megalocytes; *c*, microcytes; *d*, marked poikilocytosis; *e*, megaloblast; *f*, polynuclear neutrophilic leucocyte. (*Lenhartz-Brooks*.)

B.—Lial (splenic) leukemia. *a*, normal erythrocyte; *b*, nucleated erythrocyte, nucleus eccentrically situated; *c*, polynuclear neutrophilic leucocytes; *d*, eosinophilic (myelo) cell. The eosinophilic cell at the top has been ruptured and the granula dispersed. Two small greenish-blue nuclei, perhaps small lymphocytes. (*Lenhartz-Brooks*.)

C.—Lial (splenic) leukemia. *a1*, megaloblast; *a*, normal erythrocyte. *a2*, megaloblast with anemic degeneration; *b*, polynuclear leucocytes; *c*, "marrow cells" (myelocytes); *d*, large lymphocyte. (*Lenhartz-Brooks*.)

D.—Acute leukemia. This picture is made from two different, rapidly fatal, clinically similar cases. The upper portion is stained with Ehrlich's stain with eosin-hematoxylin; the lower portion is stained with the Plehn-Chenzinsky's stain. (*Lenhartz-Brooks*.)

anemia since we do not know the causative agent. Some of the theories of origin are:

1. *Hunter's Theory*.—That there is a hemolysis in the portal circulation, as the result of the absorption of hemolytic agents from the intestinal tract. Much iron is found in the liver cells post-mortem and lends favor to this view.

2. *Herter's Theory*.—That the *Bacillus ærogenes capsulatus* produces hemolytic agents which get into the blood stream and cause the anemia.

3. That there is a buccal sepsis and abnormal salivary secretion which acts on the red blood cells.

Hunter's theory is the one which offers the most hope at the present time.

Pathology.—The organs of a subject will be found, post-mortem, to be pale and anemic. The liver and heart show fatty degeneration. The spleen is moderately enlarged and pigmented owing to the destruction of red blood cells. There is much intestinal putrefaction, and in some cases the gastric mucosa is atrophic.

The bone marrow is especially interesting. There is an active proliferation of normoblasts which accounts for the so-called blood crises which occur at different times during the disease. There may be megaloblasts (large normoblasts or nucleated red blood cells) instead of the small normoblasts. Occasionally myeloblasts are found.

In the advanced stages of pernicious anemia atrophy or sclerosis of the bone marrow occurs, and it is then that we get a fatal termination since it is obvious that bone marrow in that condition cannot produce red blood cells.

Symptoms.—Combination of a pallor together with an apparently well-nourished body is a characteristic clinical finding. This is in contrast to other types of anemia where the body loses its fat and there is cachexia.

The description given by Addison is classical: It makes its approach in so slow and insidious a manner that the patient can hardly fix a date to the earliest feeling of that languor which is shortly to become extreme. The countenance gets pale, the whites of the eyes become pearly, the general frame flabby rather than wasted, the pulse perhaps large, but remarkably soft and compressible, and occasionally with a slight jerk, especially under the slightest excitement. There is an increasing indisposition to ex-

ertion, with an uncomfortable feeling of faintness or breathlessness in attempting it; the heart is readily made to palpitate; the whole surface of the body presents a blanched, smooth, and waxy appearance; the lips, gums, and tongue seem bloodless, the flabbiness of the solids increases, the appetite fails, extreme languor and faintness supervene, breathlessness and palpitations are produced by the most trifling exertion or emotion; some slight edema is probably perceived about the ankles; the debility becomes extreme, the patient can no longer rise from bed; the mind occasionally wanders; he falls into a prostrate and half-torpid state, and at length expires; nevertheless, to the very last, and after a sickness of several months duration, the bulkiness of the general frame and the amount of obesity often present a most striking contrast to the failure and exhaustion observable in every other respect.

Gastrointestinal symptoms are not uncommon and may even mask the picture of the anemia. Diarrhea is often associated. *Pyorrhea alveolaris* is present in practically every case and is considered by some to be a source of origin.

A hemic murmur can usually be heard over the heart. There is usually edema in the feet. Urobilin in the urine and stools is greatly increased and is indicative of blood destruction.

Diagnosis.—The blood will furnish the real means of diagnosis. The hemoglobin may sometimes be as low as 20 to 30 per cent. The erythrocytes are reduced in number; 2,000,000 is a fair average red blood count in this condition, although Lenhartz¹ refers to a reduction of erythrocytes as low as 400,000 to 800,000. There is also an enormous poikilocytosis and polychromatophilia.

There is a high color index due to the relatively high amount of hemoglobin compared to the number of red blood cells. The blood is nevertheless pale and watery looking. Nucleated red blood cells are constantly present but vary in number from day to day. Megaloblasts also myelocytes may be found from time to time. Leucocytes are as a rule normal or reduced in number.

Prognosis.—There has not, to my knowledge, been reported the recovery of a case of true pernicious anemia.

Treatment.—Rest in bed, good food, Fowler's solution, iron and transfusion, all combined intelligently will do much to prolong the life of the patient.

Splenectomy is not advised.

¹ LENHARTZ: Clinical Microscopy, page 156.

LEUKEMIA (LEUKOCYTHEMIA).

In this condition we have a reduction of the red blood corpuscles and usually an enormous increase in the white blood cells.

There are two types of leukemia:

1. Lymphocytic.
2. Myelocytic.

In the lymphatic type scarcely any cells or lymphocytes can be found, whereas in the myelocytic type the myelocytes predominate.

Etiology.—The etiology is unknown. Some authors believe that the lymphocytic form is indicative of a disease of the lymphatic system, and that the myelocytic type is indicative of the spleen and bone marrow. Ewing does not believe this but considers both forms to be a disease of the bone marrow and that the different cells which appear in the blood, in the two types of the disease, are merely different reactions to different stimuli each acting on the bone marrow. This view is strengthened by the fact that a section of bone marrow from a case dead of lymphocytic leukemia will show enormous numbers of lymphocytes and lymphoblasts (young lymphocytes).

Pathology.—The lesions are chiefly in the bone-marrow, lymphatic glands, and spleen. *The spleen is enormously enlarged*, sometimes filling half of the abdominal cavity. Sometimes it is soft, and at other times very hard on palpation. It has a dark red color. In the lymphocytic form any or all of the external glands of the body may be affected; thus the cervical, maxillary, bronchial, mesenteric, or inguinal glands may be involved. There is a simple hyperplasia found in the glands. The liver is usually enlarged from an infiltration with lymphoid tissue. The lymphoid tissue in the tonsils and the thymus gland have the same changes. Hemorrhages are not infrequent.

Lymphocytes are found in many organs in the lymphatic type, and in the myelocytic type myelocytes can be found. This is especially true in the liver.

Symptoms.—The disease is usually ushered in by a severe hemorrhage, after which profound anemia and a general weakness are noted. The spleen is always enlarged and the lymphatic glands are palpable. The glands are movable, but never tender on palpation. The liver is usually enlarged. In the beginning there is little or no fever, although later in the disease the temperature may rise as high as 103° F. Sometimes from involve-

ment of the liver there will be dropsy of the feet or a general anasarca. Hemorrhages from the nose, mouth, stomach, and bowels frequently complicate this condition. From the loss of blood fainting spells may occur.

Diagnosis.—The enlarged spleen and lymphatic glands, and the general appearance of the child with subcutaneous hemorrhages will aid in the diagnosis.

The examination of the blood is decisive. While normally a child may have 8000 leucocytes, we have in leukemia 50,000, 80,000, and I have seen cases with 100,000 leucocytes.

The normal ratio between the red and white corpuscles varies between 1 to 500 and 1 to 1000. In leukemia the ratio is so altered that we may have one colorless corpuscle to twenty, or even to five, red corpuscles. Some authors report a ratio of one red to two white corpuscles. In this high leucocyte count the predominating cell is either the lymphocyte or the myelocyte, depending on the type of the leukemia.

Prognosis.—The prognosis is bad. In spite of the best care and treatment I have never seen a case recover.

Treatment.—Fresh air, good food, and Fowler's solution should be ordered. Benzol is advocated by some but its use is subject to caution since it causes a decrease in the number of red blood cells if used in excess.

Recently x-ray and radium have been used to good effect. These agents, while not curative, certainly prolong life. Splenectomy has not been of value.

PSEUDOLEUKEMIC ANEMIA (VON JAKSCH'S DISEASE).

This disease is occasionally met with in children. It was first described by Von Jaksch. It is an infantile anemia, the origin of which is obscure.

Etiology.—It is found in infancy and has been reported in the six months baby. It is also met with in children up to four years of age. This disease usually follows as a sequel to rickets and diseases which weaken the general system, such as intestinal catarrh. It is also found in cases of tuberculosis and syphilis.

Pathological Anatomy.—The spleen is enlarged and rather firm. Histologically the changes are those of simple hyperplasia of all elements, while the sinuses contain an excessive number of leucocytes. Baginsky found many eosinophile cells in the spleen.

The changes in the viscera are described by Von Jaksch, Eppinger, Luzet, Baginsky, Audeoud and Rotch. The marrow, according to Luzet, is diffusely reddened and moist, and shows evidence of excessive multiplication of the red cells.

The Blood.—Leucocytosis is an important symptom. The white blood cells number between 20,000 and 50,000, in other cases (Baginsky) there were between 40,000 and 122,000.

According to Monti the proportion of white cells to the red may be as 1 to 100 or 1 to 15. The specific gravity of the blood is lowered, and ranges about 1040. The amount of hemoglobin is greatly reduced, often as low as 20 or 25 per cent. The same changes occur in the appearance of the red blood cells as in pernicious anemia, and nucleated red blood cells are found. Myeloblasts and myelocytes also occur at intervals. Eosinophiles are increased.

Symptoms.—There is a marked enlargement of the spleen and it occupies the left hypochondrium reaching at times to the crest of the ilium. The liver is slightly enlarged, lymph nodes can be felt in most parts of the body. Fever is usually absent although a febrile condition may mean an acute or chronic disease independent of the anemia. Icterus is sometimes present.

There is a progressive weakening, and pallor is marked.

The course of the disease is chronic.

Prognosis.—The prognosis is not good, especially if rickets or lues is associated. Specific therapy for these conditions may cause an improvement in the blood picture.

Treatment.—The most valuable drug in the treatment of this anemia is arsenic which may be given in the form of Fowler's solution. Iron may be given in combination. One drop four or five times a day is the dosage for infants. For older children 2 drops may be given. If rickets is associated, codliver oil in doses of 10 drops three times a day, increased gradually to 1 dram three times a day should be given. If lues is present specific treatment should be employed.

The diet must be regulated, and this may result in a decided improvement in the condition of the child. Fresh milk, yolk of egg, cereals, such as whole wheat, wheatena, and cornmeal with fresh cream and fresh vegetables should be included in the dietary.

CHLOROSIS.

Chlorosis, sometimes called chloranemia, occurs in girls about the period of puberty. There is extreme pallor of the mucous membrane, pale and greenish tint to the skin, and a pearly eye. Associated therewith is extreme lassitude, a tired feeling, and either suppression or irregularity of menstruation. On the slightest exertion there will be dyspnea, palpitation, and dizziness. As a rule, such children do not emaciate; they are rather well nourished. Owing to a freaky appetite, the bowels are irregular and usually constipated. The urine frequently contains indican, and some observers believe that the intestinal toxemia is an important factor in the causation of this disease.

Etiology.—Sedentary occupation associated with lack of exercise, or poor hygienic surroundings, may induce this condition. Nervous girls, susceptible to mental influences, such as fright or worry, are more prone to the development of this condition than robust, healthy girls. Autointoxication is certainly a factor, as I have frequently seen chlorosis in girls suffering with chronic constipation.

Pathology.—Distinct pathological lesions cannot be attributed to this condition. In some cases ulcer of the stomach is associated, and this latter condition may be fatal.

Symptoms.—The appetite is poor and such girls invariably crave for sour and spiced foods to stimulate the appetite. Constipation is almost always present. Headache and other nervous symptoms are also present. Such girls are very emotional, and cry and laugh very easily. They are very sensitive. A venous murmur can usually be made out in the vessels of the neck. There is a blowing systolic murmur which can be heard over the heart in the mitral region and also in the region of the pulmonary artery. Venous stasis is most frequently seen in the femoral veins, and varicose veins are sometimes seen over the thighs and ankles. Menstruation is irregular and the flow is scanty or very profuse and sometimes painful. There is a decrease in the percentage of hemoglobin and also a decrease in the number of red corpuscles. The red cells may be reduced to 4,000,000.

The spleen may be slightly enlarged, but on this symptom no reliance can be placed. A puffiness of the face or edema of the ankles due to a sluggish return circulation is occasionally seen.

When localized areas of pain are complained of in the region of the stomach, then gastric ulcer should be suspected.

Diagnosis.—Chlorosis is met with in girls only at or about the period of menstruation. The greenish tint to the skin, from which the disease derives its name is its characteristic diagnostic feature.

Prognosis.—This is always good, although the disease may last several years. If chlorosis is a forerunner of tuberculosis, then a fatal termination may occur. The outcome of a case depends on heroic restorative treatment.

Treatment.—*Hygienic Treatment:* Remove the child from its immediate surroundings, from the city to the country. If chlorosis occurs in a girl living at a boarding-school, in a convent, or in a girl working in a factory, the following hygienic measures should be ordered:—

1. Sleep in an airy room with the windows open.
2. Discontinue working, or studying if at school, to procure mental rest.
3. Change the entire mode of living, so that there is neither care nor worry for the chlorotic girl.

Exercise.—Gentle exercise, walking, swimming and the lighter exercises of physical culture followed by a shower-bath and massage are valuable. Friction with a coarse towel after the daily bath is useful to stimulate the circulation. Reading or sewing at night must be forbidden.

Nutrition.—Proteins in the form of milk, meat, eggs, cereals, cream, butter, and cheese should be liberally given. All fresh fruits may be allowed. Regularity in feeding must be observed, although a drink of milk, buttermilk, cocoa, or zoolak may be taken between meals.

Medicinal Treatment.—The use of iron in chlorosis is one of the few instances in medicine where we may expect uniformly marked improvement upon the administration of a drug. Bland's pills, (grains v), one pill three times a day during the first week, 2 pills three times a day during the second week, and 3 pills three times a day during the third week and thereafter for several months is the dose to be administered.

A soluble preparation of iron such as peptomangan may be given if a liquid form of therapy is desired. As iron is constipating, the bowels must be kept open. Dyspeptic symptoms may be relieved by alkalies.

When chlorosis continues for a long time, and there is extreme exhaustion, transfusions of 4 to 8 ounces of citrated blood are advised.

MUSCULAR RHEUMATISM (MYALGIA, MYOSITIS).

This painful condition is rarely seen in children. It is characterized by pain when the muscles affected are brought into play. When the disease affects the muscles of the neck it is called acute torticollis. When the intercostal muscles are affected it is called pleurodynia. When the lumbar muscles are affected it is called lumbago. Peculiar contractions of the muscles frequently follow persistent muscular rheumatism and sometimes cause permanent deformity (see chapter on Torticollis). Infants so affected usually cry when the group of muscles involved are moved. There is no fever present.

R. K., 16 years old, was attacked with a severe tonsillitis. The cervical glands were enlarged and tender on palpation. Two days later after going out into the street she had violent muscular pains involving the back, groin, and muscles of the thigh. It was a distinct lumbago and a general myalgia. There was also a painful sciatica. With the aid of massage and the internal administration of 5 grains (0.3) salophen every four hours these pains gradually subsided. After these pains left there were pains involving the intercostal muscles, so that we had a lumbago followed by pleurodynia. Rest in bed, warmth, and massage relieved this condition permanently.

Treatment.—Local treatment consisting of massage aided by gentle faradic electricity is very useful. Warm, moist fomentations, such as flaxseed meal poultices, are very soothing and seem to do good. The internal administration of salicylate of soda has not seemed to benefit my cases. Codeine in $\frac{1}{10}$ - to $\frac{1}{5}$ -grain doses, repeated every two or three hours, can be given until the pain ceases. In some cases chloral hydrate combined with bromide of sodium will afford relief. Rubbing the affected muscles with ol. hyoscyamus seems to relieve.

PURPURA.

Hemorrhages into the skin or mucous membrane are designated as purpura. When small they are called petechial; when large they are called ecchymoses. Purpura is frequently associated with the infectious diseases.

Martha B., 7 years old, was brought to the Willard Parker Hospital. She had been ill two days before admission. The diagnosis of nasal diphtheria was made. On admission the pulse was 158. Two days later it dropped to 90, and on the third day the pulse-rate sank from 96 to 66. A general purpura was noticeable. There were bluish discolorations of the skin visible on the extremities. The resident physician called my attention to a hematuria. The case ended fatally.

PURPURA HEMORRHAGICA (MORBUS MACULOSUS WERLHOFII).

This is the most severe form of purpura. The lesions are a series of hemorrhages confined to the mucous membrane and skin. On the skin purpuric spots are seen which denote hemorrhages. These hemorrhages are seen in the lower and upper extremities; also on the face and abdomen. The conjunctival mucous membrane

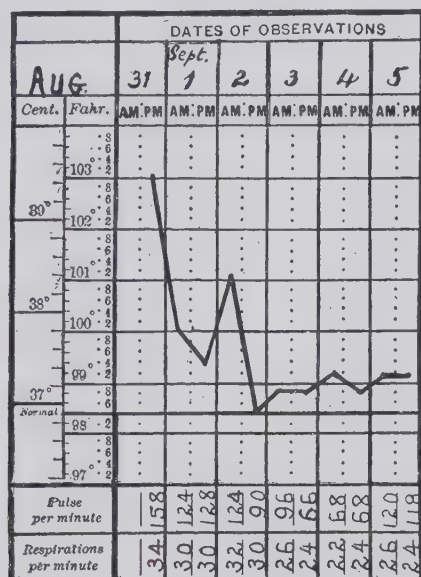


Fig. 211.—Malignant purpura complicating nasal diphtheria. General sepsis. Toxic nephritis, meningitis, myocarditis. Note pulse. Fatal.

shows ecchymotic areas. The gums bleed easily and there are hemorrhagic areas on the soft and hard palate. Hematuria and hemoptysis are sometimes seen.

Diagnosis.—The only disease that might be taken for purpura is scurvy, but the general history of the case associated with malnutrition will clear up any doubt.

Treatment.—Rest, iron, small doses of ergot and hydrastis internally, lemons, oranges, and a nutritious diet. Aromatic sulphuric acid in 5-drop doses, several times a day, should be administered.

**PURPURA RHEUMATICA (PELIOSIS RHEUMATICA:
SCHONLEIN'S DISEASE).**

The association of hemorrhages with affections of the joints characterizes this disease. It has frequently been noted that there is tenderness in the joints during the course of simple purpura. But the more pronounced form of fever, in conjunction with swellings and tenderness of the joints, *plus* the characteristic appearance of the subcutaneous hemorrhages appearing in purpuric spots, differentiate peliosis from simple purpura.

Associated with this rheumatic affection we frequently have extravasations of blood and serous effusions into the joints, giving a decided fluctuating feeling. One very important point is the fact that cardiac lesions do not complicate this condition. Cases of this kind have frequently been reported, and Baginsky lays stress on the non-existence of heart lesions in this affection.

The following case came under my observation:—

A child, George P., about 9 years old, was attacked with pains in his feet and cried when attempting to walk. He had had some very violent exercise during the four or five weeks preceding this attack. The mother stated to me that he had frequently complained of joint pains, but she attributed them to "growing." His general condition was otherwise healthy. The examination gave me the following status:—

A very well nourished boy: His weight was 84 pounds. The examination of the thorax showed both heart and lungs normal; no cough; heart sounds regular, strong; pulse, 96. The temperature was 100.2 in the rectum, and respiration 36. The tongue was slightly coated; appetite good; bowels always inclined to constipation.

The examination of the joints showed severe tenderness and swelling in both knees and ankles; slight pain on palpating or rotating the hip joint. The most marked tenderness and swelling was found at the knee joints. The upper extremities—shoulder, elbow and wrist—were normal. The eruption on the skin was of a purplish or bluish color, and looked like a distinct subcutaneous hemorrhage. It was confined to the lower extremities, covering almost completely the inner portions of both thighs, the ankles, and more especially the calves of both legs. The spots were very irregular in outline, in some places confluent, resembling more particularly the eruption of measles.

The child was put to bed and bandages applied. Ergotine $\frac{1}{50}$ grain every four hours, besides 15 drops of tinct. ferri acet. æth. in water after each meal, was ordered.

The child had measles, complicated with bronchitis, when 3 years old, lasting in all about one month. No disease previous to this; no summer complaint, and nothing since that time.

PLATE LIX



Henoch's purpura. Note ecchymotic spots on lower extremities.

There was no evidence of scurvy; teeth were well developed, perfectly normal; the gums were healthy. The mother had two other children. She had no miscarriages; no reason to suspect lues.

I believe the etiological factor in this case was the traumatic element, namely, the violent exercise causing both the hemorrhages and the inflammatory affection of the joints.

HENOCB'S PURPURA.

Hemorrhagic areas confined to the abdomen and lower extremities are sometimes seen. There is also vomiting and abdominal symptoms, such as diarrhea (bloody stools) and colicky pains. There is marked distention of the abdomen and pains in the joints. This condition resembles that which has already been described as Purpura Rheumatica.

LITHEMIA (LITHURIA).

Haig and Rachford have given us a very clear conception of this condition, which is simply an excess of uric (lithic) acid in the blood. Haig designates this condition as uricacidemia. Other writers call it lithuria. Rachford calls this "leucomain poisoning."

Etiology.—When this condition is met with in children, we can usually look to the lithemic ancestors for the origin of the disease. Imprudent diet, such as excess of proteins, may be a factor. Sedentary life and lack of proper metabolism invite this condition. The alloxuric bodies are excreted by the skin, kidneys, and intestinal canal. These bodies are removed by the kidney cells from the blood into the urine. When they are in excess they must, therefore, have been present in solution in the blood before their elimination.

The presence of uric or lithic acid, xanthin, hypoxanthin, heteroxanthin, and paroxanthin are the factors causing this trouble. We are still in the dark concerning the manner in which these bodies act.

If the kidneys are diseased these bodies are retained and the skin is called upon to do the work which the kidneys fail to do. Thus it is that hot baths which promote diaphoresis eliminate through the skin, in addition to stimulating the action of the kidneys.

Symptoms.—The newly born lithemic infant frequently eliminates an excess of urates during the first few days of life. In such infants crystals of uric acid may be precipitated into the

tubules of the pyramids of the kidney. Jacobi says that these uric acid infarctions may subsequently be washed out of the tubules and serve as the nuclei of urinary calculi.

Nocturnal incontinence is frequently a symptom of lithemia. True arthritic gout resulting from uratic deposits in the tissues about the joints is very rare in childhood.

Fever, crying while the child passes urine, scanty urine which usually deposits a reddish sand on the diaper, and irritation of the external genitals are the symptoms which appear at the time of urination. The urine is very acid and we speak of this condition as "a uric acid form of lithemia." Sometimes there are gastro-enteric manifestations, such as vomiting, headache, gastric pain, convulsions, an acetone odor of the breath, and constipation. These gastric symptoms bear no relation to improper diet. They are usually met with in children who are carefully guarded as to the diet. Such children are extremely nervous and irritable. Eczema is a very common manifestation of this condition. Unless a proper understanding of this condition exists it will persist and be difficult to relieve.

The urine in lithemia is high colored; the specific gravity increased. On standing, there is a sediment of red sand (urates). If the urine is examined immediately after a paroxysm then the poisonous xanthin bodies previously mentioned may be found present. Transient albuminuria is occasionally met with.

Treatment.—The diet is the most important part of the treatment. Cereals must be given; beef juice, soups, broths, and fruits. No alcoholics should be given; in fact, all rich and heavy articles of food must be excluded. Meat must be given sparingly. Salads and gravies are objectionable. Infants require massage. This passive form of exercise will stimulate the circulation. If children are old enough to exercise, then exercise should form an important part of the treatment.

Drug Treatment.—Calomel should always be given in the commencement of the treatment. We must aid in keeping the bowels loose during the whole course of treatment.

Salicylate of soda and salol are useful eliminatives. Phosphate of sodium and benzoate, especially if eczema exists, are valuable. Alkaline waters, such as white rock and apollinaris, may be given *ad libitum*. The Carlsbad waters have the same eliminative effect. Dilute hydrochloric acid or dilute phosphoric acid in 3- to 5- drop doses before meals is especially indicated when severe headache and

gastric symptoms exist. Urotropin in 2-grain doses may be given in tablet form.

HEMOPHILIA.

Hemophilia is a diathesis which remains latent until an irritation causes bleeding. A slight traumatism will cause a hemorrhage which may appear of spontaneous origin, thus petechial skin spots, cutaneous hemorrhage and painful swelling of the joints may be found in a hemophiliac.

This is usually an inherited condition. It is characterized by a tendency to bleed, hence the term "bleeder" is applied to this class of cases. Whole families are found in which this tendency to bleed exists.

Pathology.—The walls of the blood-vessels show no alteration, either macroscopically or microscopically. The swelling of the joints is due to hemorrhages into the articulations and into the surrounding tissues. The tissues are blanched from loss of blood. The surface of the body shows petechiæ or bruised patches. The blood of a hemophiliac is characterized by a delayed coagulation time when outside of the body. The blood plates are not diminished but may be increased in numbers. Thrombokinase which aids in the coagulation of the blood is usually deficient in quantity.

Symptoms.—The appearance of the child does not always disclose the tendency to bleed. It is only when an operation is performed, or an injury exists, that alarming and frequently fatal hemorrhages are seen. Epistaxis is the most common symptom noted. Swelling of the joints resembling rheumatism is frequently seen. The bleeding takes place from the capillaries, most often an oozing which may continue for weeks. The subjects of hemophilia are sensitive to cold.

In the chapter on Syphilis I have already described a case of bleeding in which the lesions of *syphilis* were present.

Annie G., 13 years old, was breast-fed in infancy. She had diphtheria when 1 year old. Had pertussis when 2 years old, which lasted nine weeks. Had pneumonia twice. No history of rheumatism given and had no other infectious disease.

History of Bleeding.—Had always been troubled with hemorrhages. The nose bled at the slightest provocation. Blood spitting was quite common. The slightest irritation of the bowels with looseness was associated with blood in the stools. Large varicose veins were found over the legs. There were a number of scattered nævi. Not infrequently the veins of the legs bled daily for a period of twenty or thirty days.

The Heart.—There was a loud systolic murmur heard in front and behind, and transmitted to the side. This endocarditis was a sequela to the attack of diphtheria. The child's weight when seen by me was 67 pounds. Stypticin seemed to do more good than ergot internally. Hydrastinine hydrochlorate, $\frac{1}{6}$ grain three times a day, seemed to check the bleeding during another attack. When last seen by me the child was developing fairly well.

Prognosis.—This depends on the frequency of the hemorrhages and the child's general condition. In 152 cases reported by Grandidier more than one-half died before completing the seventh year, and only nineteen attained majority.¹

Treatment.—All operations, no matter how slight, should be avoided if possible. Even the extraction of a tooth must be seriously considered, owing to the danger of bleeding. Adrenaline, 3 to 10 drops of a 1-1000 solution injected hypodermically will stimulate the terminals of the sympathetic system. Unless a permanent paralysis of the capillaries exists this drug is indicated.

When injected subcutaneously 5 to 10 cubic centimeters of a 10 per cent. sterilized gelatine solution will be indicated in gastric hemorrhage. In melena neonatorum the injection of gelatine solution is of great value.

Human Blood Serum.—Fresh human serum taken from a donor on whom a Wassermann reaction has been made is a valuable remedy in checking hemorrhage. Ten cubic centimeters gradually increased to thirty cubic centimeters may be injected intravenously in intervals of four to six hours. If human serum cannot be obtained then 10 cubic centimeters of horse serum may be substituted.

Transfusion.—This is the most specific and the most satisfactory treatment in all forms of hemorrhage. Certain precautions are necessary in every transfusion hence a test should be made for agglutination and hemolysis. It is self understood that a Wassermann reaction should always be made to exclude the danger of transmitting syphilis. If the blood of the recipient is properly matched to that of the donor and we are dealing with an infant, 25 to 30 cubic centimeters may be injected through the superior longitudinal sinus. If the bleeding does not cease entirely within 24 hours the injection or transfusion should be repeated.

Drug Treatment.—Gallic acid in 3- to 5- grain doses three or four times a day is a good hemostatic. Hydrastine $\frac{1}{8}$ grain every three or four hours is also of value.

¹ See article in "Starr's Textbook."

SYMMETRICAL GANGRENE (RAYNAUD'S DISEASE).

This is an obscure condition in which the gangrene is symmetrical.

Etiology.—It is caused, no doubt, by the invasion of pathogenic bacteria. Infectious diseases which devitalize the body are believed to predispose to this condition. Injury and hemorrhages, such as epistaxis, have been forerunners of this condition.

Symptoms.—When acute there is fever and enlargement of the spleen, hematuria, or hemoglobinuria. The affected part feels cold and appears bluish; sometimes there are vesicles containing a sero-purulent fluid. This condition lasts from two to three weeks, although it may extend over many months. The disease ends in mummification and gradual decay of the affected parts. The toes, fingers, ears, or tip of the nose may be the seat of this affection.

Prognosis.—A cautious prognosis should always be given. While records of cures exist, the diagnosis may always be questioned.

Treatment.—Surgical removal of the gangrenous part is the only way to prevent further extension of the mummified parts.

III.

TRANSFUSION.

JUDGING by the number of cases of transfusion reported in literature during the last five years the profession is recognizing the value of this therapeutic measure. Recently I reported a series of malnutrition cases transfused¹ with excellent results. In puny in-

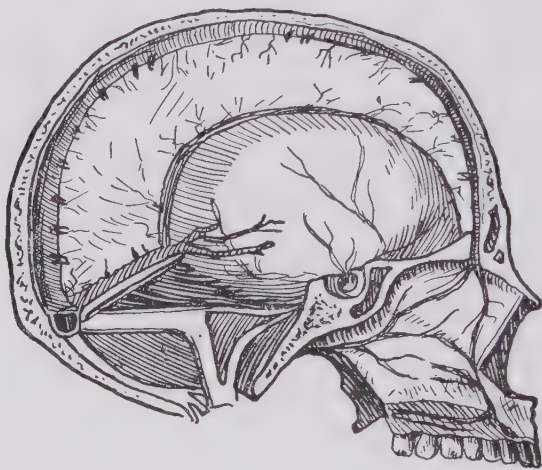


Fig. 212.—Sagittal section of the skull showing the sinuses of the dura. This view also shows the widening of the superior longitudinal sinus from before backward. (After Gray.)

fants in which small vessels are found it is much easier to enter a large vein, such as the longitudinal sinus, than it is to enter the jugular or median cephalic vein. Credit is due to Marfan and Tobler for disseminating the knowledge of the longitudinal sinus route for intravenous therapy.

Indications.—In atrophic or marasmic infants with faulty metabolism or where no food is taken and there is progressive loss of weight, we will find cold extremities. Such cases are adapted for transfusion. In cases of *melena neonatorum* in which bloody stools are found, transfusion is a life saver. In hemophilia caused by

¹ Complete bibliography is published in *New York Medical Record*, October 29, 1921.

congenital disease bleeding is a constant or frequent symptom. Excellent results are reported when such cases are transfused. When the body has been depleted after hemorrhage following a circumcision, blood injected into the longitudinal sinus will not only check a hemorrhage but will increase the volume of blood. In a case of hemorrhage following an excision of cervical glands post opera-

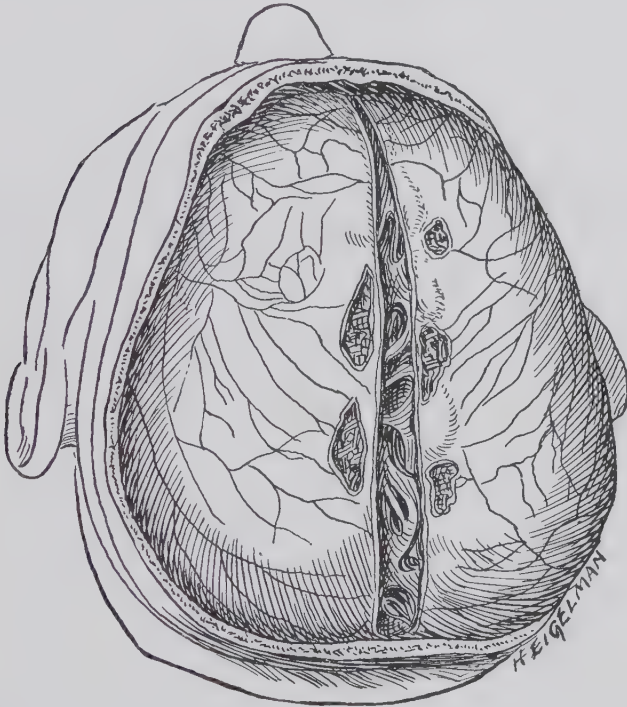


Fig. 213.—Superior longitudinal sinus laid open after removal of the skull cap. Note the widening of the sinus from before backward. (*Poirier and Charpy, after Gray.*)

tive treatment was unavailing until 1 ounce of human blood was injected by the sinus route.

Transfusion is indicated in leukemia, in secondary anemia, following toxic conditions during convalescence after scarlet fever, diphtheria, meningitis and in influenza.

When blood, sufficient for taking a blood culture, is required as in a case of suspected sinus thrombosis or in malignant endocarditis, there is no quicker means of procuring blood than by ob-

taining it through the longitudinal sinus. When rapidity of action is required, as in a septic diphtheria requiring antitoxin no vein equals the sinus.

Neosalvarsan has been injected by me through the sinus route many times in conjunction with Baketel, in small infants through the sinus. When fever is present transfusion is not contraindicated. A marked antipyretic effect was noticeable in several febrile cases following transfusion.

Gain in Weight.—All of my cases showed a decided increase in weight. Several cases that lived but three or four days, moribund when transfused, showed a better appetite, better digestion, and always an increase in weight.

Technic for Agglutination Tests.—Moss demonstrated that the absence of agglutination precludes the possibility of hemolysis and described a simple, rapid, and sufficiently accurate method. For our work we follow the technic of Moss as modified by Vincent. The Vincent technic is as follows:

Two prepared sera, a clean glass slide, and a number of clean toothpicks are needed to make the test. One or two drops of serum II is placed on the left half of the slide, and an equal amount of serum III on the right half of the slide. The ear or the finger of the person tested is punctured and a small drop of blood is transferred on the point of a knife blade or with a toothpick to each of the sera in turn. The blood is stirred into the serum. The blood should be transferred before the coagulation has commenced and care should be taken to avoid mixing the two sera. Agglutination of the corpuscles is accelerated if the serum is agitated by the slide being tipped from side to side. If the reaction is negative, the corpuscles make a uniform suspension in the serum. If the reaction is positive, the masses of agglutinated corpuscles usually appear in less than a minute and are discernible to the naked eye. Rouleaux formation can be eliminated if the mixture is stirred; agglutination is not broken up in this manner. In doubtful cases the reading should be confirmed by microscopic examination.

In order to eliminate contamination in handling the blood and sera a different toothpick or wooden match stick is used in each step of the technic.

After obtaining the proper donor, the front of the elbow region is painted with $3\frac{1}{2}$ per cent. tincture of iodine and a tourniquet applied just below the deltoid region lightly enough to cause the veins to stand out prominently but not so as to obliterate the

arterial pulse. The median cephalic or median basalic vein (which-ever is more readily accessible) is then punctured, and a prede-termined amount of sodium citrate solution is added to make a 0.3 per cent. solution, the assistant constantly stirring the mixture slowly.

Technic.—The infant should be wrapped in a mummy bandage, well pinned so that the arms and legs are confined, and placed flat on its back on a table. The head should be steadied on both sides by an assistant while the needle is inserted into the sinus. As a rule the sinus can be entered through the anterior fontanel up to the end of the second year. Anatomically the sinus does not vary.

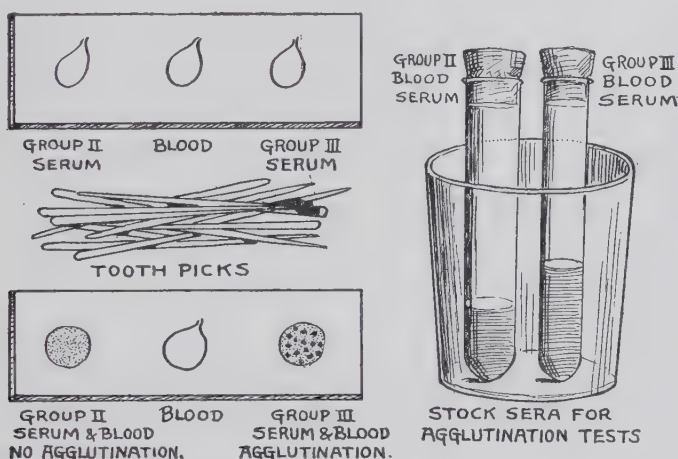


Fig. 214.—All the apparatus necessary for rapid and complete agglutination tests of donors' and recipients' bloods. Technic according to the method of Vincent.

It grows wider towards the back of the head, hence, we should always utilize a point as far posteriorly as possible. As the needle is pushed through the posterior angle of the fontanel it should be directed downward and backward in line with the sagittal suture. The landmarks are positive, and with but little practice we cannot fail to enter the sinus. As the sinus lies very superficial we need not go deeper than 1 or 2 millimeters. For this purpose a needle one-half inch long of a 20- or 22- gauge, with a sharp point, is best adapted. For withdrawing blood a Luer or Record syringe should be attached. As the needle penetrates the sinus, resistance is lessened and we encounter the same sensation which we feel when the needle enters the dura in doing a lumbar puncture.

We are now ready to aspirate sufficient blood for diagnostic purposes, or to transfuse the required quantity of blood or medication. As there is negative pressure within the sinus, before injecting it is better to withdraw blood, thus making sure we are actually in the sinus. The fluid, be it saline or neosalvarsan solution, is best given by gravity and should be given slowly. A cylinder with a capacity of 30 to 100 cubic centimeters may be used. One end of a piece of rubber tubing is attached to the cylinder and the other end has a connecting tip which fits into the needle. It is

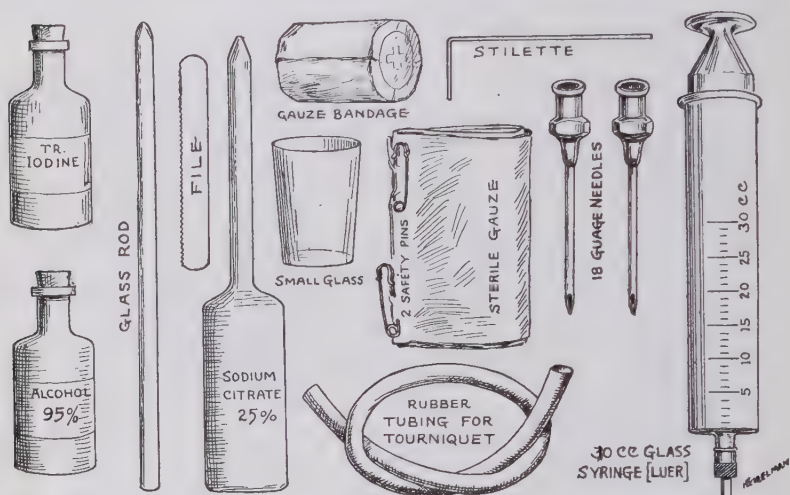


Fig. 215.—Transfusion outfit. A complete set of the apparatus as used in the transfusion operation such as one may find in any physician's office. The citrate solution is obtained from any of the large chemical houses.

of advantage to have a stopcock either at the end of the cylinder or near the end of the tubing. The needle is inserted into a small syringe attached. By slight aspiration one can determine whether sinus has been entered; if so, the syringe is detached, and the apparatus, which has been filled and the air expelled, is connected.

During the injection the infant should be closely watched, his color, pulse, and respiration noted. Vincent warns against injecting too rapidly, as increase of intracranial pressure caused vomiting and disturbed respiration, which corrected itself as soon as the flow of blood was checked temporarily. Air pressure in the tube should be released by detaching the syringe before the needle is withdrawn.

PLATE LX



Aspirating the longitudinal sinus. Adapted for the Wassermann test, for transfusion, and for intravenous medication. Child in dorsal position. Head held firmly by assistant.

PLATE LXI



Introducing the needle. Needle directed slightly downward and backward in line with the sagittal suture, penetrates the sinus to the depth of 2 mm. 22-gauge needle used.

PLATE LXII



Aspirating blood for diagnostic purposes or injecting blood for transfusion.

There is no danger of losing too much blood by the puncture even though a large needle is used.

Quantity Injected or Dosage.—In young infants of one or two months, no more than 30 to 50 cubic centimeters of citrated blood was injected into the sinus at the first treatment. The pulse, temperature, and general condition were carefully noted, especially the surface temperature of the extremities. If no improvement was noted a second injection was given on the following day, using the same dosage of 30 to 50 cubic centimeters.

Many cases are reported in which an intravenous injection of 35 cubic centimeters of blood in the newly born infant saved life. Lambert reports the case of an infant suffering with a hemorrhage of the umbilicus after the cord dropped off. With an intravenous injection of 35 cubic centimeters of blood the hemorrhage ceased and the infant recovered from shock due to loss of blood.

Case Records.—In this series of cases the transfusions were performed at the Infanteriorium¹ in association with Samuel B. Burk.

CASE I.—Diagnosis: Malnutrition; Pretubercular anemia. Becky W. (smaller and weaker of a premature twin), aged 5 weeks, weighing 6 pounds and 5 ounces. Referred by the New York Hospital Social Service. Mother died of tuberculosis 11 days after labor.

First week following admission: Feedings consisted of 5 drams of dryco and 3 ounces of water, every three hours; patient gained 8 ounces. 2d week: Gastrointestinal symptoms and cough developed; there was a loss of 3 ounces. 3d week: Cough, weakness and occasional night sweats; loss of 2 ounces in weight. 4th week: Symptoms persisted; loss of 4 ounces in weight. 5th week: An acute febrile grippe developed and the infant lost 8 ounces, the prognosis at this time was bad.

First Transfusion.—Twenty-five cubic centimeters of citrated blood was injected into the circulation through the sinus, and 2 cubic centimeters through the jugular vein. During the following two days the food was taken better and there was an increase of 3 ounces in weight. She began to take notice of her surroundings. The stools became normal. During the following 11 days there was a gain of 13 ounces. The weight was now about the same as on admission.

Second Transfusion (two weeks later).—Twenty-five cubic centimeters citrated blood injected through the sinus. The face became flushed immediately after the sinus transfusion. The radial pulse was 72. Following the second transfusion there was a marked improvement in the appetite. Patient has steadily gained in weight since the last transfusion. The

¹ An institution devoted to the care and feeding of marasmic and premature infants.

feedings at present consist of milk, barley water, dextri-maltose and cane sugar. As a diluent, anti-scorbutic, and for the vitamine content, the juice of spinach, carrots, parsnip and celery had been used when prepared by steaming these fresh vegetables in a double boiler. The earthy salts contained in the vegetables have a marked nutritive value as clinically demonstrated by the large number of cases that have improved with this modification of the feedings. No medications had been given this patient.

CASE II.—Diagnosis: Malnutrition; Pylorospasm. Agnes M., aged 17 days, weighing 6 pounds at birth and 5 pounds on admission, was referred by Fordham Hospital. Mother died of tuberculosis when the infant was 11 days old. On admission to the Infanterium, infant appeared poorly developed and nourished with a feeble pulse and cold extremities. She was restless, vomited after each feeding, the stools contained curds and mucus, and the buttocks were excoriated. The prognosis was bad. Feedings consisted of 4 drams of dryco and 2 ounces of water every one and one-half hours, of which about one ounce was taken. After the third day, human milk was tried with no better results.

Transfusion.—Because of the progressive weakness and loss in weight 30 cubic centimeters of citrated blood was given by way of the sinus, the father acting as the donor. The day following the transfusion, there was a notable improvement in the appearance and appetite of the patient. The feedings which were refused the day prior to the transfusion were readily taken. The stools showed a better digestion of the food. There was less restlessness. The infant gained 6 ounces in one week. During the second week following the transfusion a large quantity of food was taken and well digested. The infant gained 7 ounces during this period. Six weeks later the patient was discharged in a splendid condition.

CASE III.—Diagnosis: Malnutrition; Pylorospasm. John G., aged 5½ months, weighing 7 pounds, was referred by the Brooklyn Department of Charities. Family history has no bearing on the present condition. On admission to the Infanterium, the infant appeared prostrated. His skin was dry and his muscles were soft and flabby; the abdomen was prominent and the ribs showed typical beading. There was a thickening of the epiphyses of the long bones. There was sweating of the head and a marked baldness over the occiput. The child was restless, the extremities were cold and he had a poor appetite. The stools were foul smelling and contained undigested food. The infant rarely took more than two ounces at one feeding. Prior to admission a diagnosis of tuberculous meningitis had been made. Examination of the spinal fluid was negative for evidences of tuberculosis or lues. A Wassermann test of the blood was also negative. A von Pirquet test was negative. In view of the foregoing a clinical diagnosis of intestinal auto-intoxication was made. Bulgarian bacilli, buttermilk, and whey with dextri-maltose were included with the feedings. Special care was exercised in connection with the hygiene of

the infant and special stress was laid upon the regularity of the feedings. The feedings approximated 65 calories to the kilo. of body weight.

Transfusion.—After two weeks of careful feedings during which mineral salts were also given, it was noted that no progress was made in improving the condition of this patient and a transfusion was therefore performed. Thirty cubic centimeters of citrated blood was given intravenously through the sinus. This patient had a marked reaction following the transfusion. The radial pulse was small in size, regular in rate and rhythm and 82 to the minute. There was pallor of the face, particularly about the nose and mouth. Lateral and vertical nystagmus and right sided strabismus were observed. On the day following the transfusion the infant showed improvement. Two days later the appetite improved, the stools became less offensive in odor and a gain of 2 ounces in weight was noted. From this time there was a progressive gain in weight. At present, the infant weighs 17 pounds and is in excellent health.

CASE IV.—Diagnosis: Malnutrition; Marasmus. Jane C., aged 1 month, weighing 7 pounds, was referred by the Babies' Welfare Federation. Family history has no bearing on the present condition. On admission to the Infantorium, the infant appeared poorly nourished, was cyanotic and the extremities were cold. Although breast fed, the child did not seem to gain any weight. The stools were green and contained many curds. The weight remained stationary for several weeks.

First Transfusion.—Thirty cubic centimeters citrated blood was injected through the sinus. An immediate change in the color of the skin and in the body temperature was noted. The skin, which was cyanotic soon became pink, the cheeks were flushed and the ears assumed a reddish color. The feet felt warmer. The temperature, which had been 97.5°, rose to 98.2° in three hours. On the following day, the appetite improved, the child nursed better, the stools were better in color and the general appearance of the body was improved. On the third day the child showed a gain of two ounces in weight.

Second Transfusion (one week later).—After injecting 2 ounces of citrated blood further improvement was noted. The infant progressively gained in weight, nursed better, slept better, and seemed to have a new lease of life. An apparently lifeless infant was transformed into a very lively one within three weeks after the second transfusion.

Summary.—1. Fourteen transfusions were performed on 10 infants.

2. The ages ranged from 9 days to 6 months. Seven were under 2 months of age.

3. The amount of blood injected averaged about 1 ounce.

4. The time of injection averaged about 90 seconds.

5. Four injections were followed by severe reactions; 7 by moderately severe reactions, and 3 by slight reactions. The severe reactions consisted of a short period of dyspnea which lasted about 25 to 40 seconds. A child who oftentimes cries lustily when the procedure is begun becomes

suddenly quiet. Cyanosis of the face and pallor about the mouth appears about this time together with lateral and vertical nystagmus. The radial pulse remains unchanged. The child soon thereafter again becomes noisy and restless. The period of quietude lasts a few minutes.

6. A 0.3 per cent. citrated solution was used in our transfusions without any harmful effects. This amount of sodium citrate facilitated the passage of the mixture through the small caliber of the needle utilized with greater ease than when the 0.2 or 0.25 per cent. solutions was used.

7. In 4 patients there was a marked improvement following transfusion; in 6 patients there was a slight improvement, and in 2 patients there was no improvement.

8. Feeding should be delayed for at least one hour after transfusion. Children fed before this time has elapsed vomited,

Conclusions.—1. Transfusion of citrated blood is a simple operation and a recognized valuable therapeutic agent. Its use should become an everyday procedure in hospital and private practice.

2. Transfusion of blood is oftentimes a life-saving procedure in the treatment of diseases of the hematopoietic system. The so-called hemorrhagic diseases of children are greatly benefited by this operation.

3. Transfusion of blood is valuable in the treatment of malnutrition. It is valuable in treating the cachexias following the acute infectious diseases.

4. Transfusion of blood improves the general condition of patients with gastrointestinal disturbances who do not improve with formula feedings or with the use of mothers' milk. This is particularly noticeable when marked dehydration is present following failures after the use of hypodermoclysis, rectal instillations and venous infusions.

5. Transfusion improves the prognosis in premature infants.

6. Transfusion of blood is best performed in infants by using the superior longitudinal sinus because of its large caliber and its superficial location.

Complications following Transfusion.—The following case occurred during my service at the Willard Parker Hospital. It illustrates a rare complication after transfusion:

Rose G., 5 years old, was admitted to the hospital with a temperature of 104° F. She was ill six days with a severe toxic condition. The rash was a punctate erythema. The prognosis was hopeless. Nine hours after admission the temperature rose to 105° F., pulse 164, respiration 44. An injection of 240 cubic centimeters citrated blood from a parent was given. Six hours later her temperature dropped to 103° F. On the following day the temperature dropped to 101° F., although it rose to 104° F. in the evening of the same day. Three days after the first transfusion a second transfusion of 210 cubic centimeters was given. The child seemed brighter although the pulse and temperature were not markedly influenced

by the second transfusion. Four days later 240 cubic centimeters from an uncle was transfused. Within 24 hours that child's temperature, which before the third transfusion was 103.6° F., dropped to 100.6° F.

The child made a slow convalescence. On the 27th day of illness the temperature was normal and remained so for two days. About two weeks after this transfusion a slight febrile disturbance appeared. There was a distinct chill and a rise of temperature from 98.8° to 105° F. The temperature then dropped to normal and remained so three days, when the same phenomena was again observed, a chill followed by a rapid rise of temperature to 104° F. and again the temperature dropped to normal. The spleen was enlarged. Three more days intervened, again a chill, followed by a rise to 106.4° F. Quinine was given. The temperature then fell to normal and remained normal. The child was discharged two weeks later in good health. A study of the temperature curve will show an interesting phenomena. We had a recurrence of fever once every three days, and the blood examination revealed the plasmodium. As this was the only case in the hospital, the inference was that the plasmodium entered the circulation with the donor's blood.

IV.

DISEASES OF THE GLANDS AND LYMPH NODES.

STATUS LYMPHATICUS.

THIS is a definite pathological condition associated with a hyperplasia of lymphoid tissue throughout the body. Subjects who have this lymphoid diathesis are prone to sudden death if given an anesthetic, or are liable to death by drowning and have also a weak resistance to infection so that they die early in the course of an infectious disease. Death may also result from suffocation if the thymus gland is so large that it compresses the trachea.

Pathology.—In addition to pathological changes described under Symptoms there will be found at autopsy a strikingly small heart and aorta. The Peyer's patches will be found to be hypertrophied, as will all lymph tissue.

Symptoms.—In infants the thymus will be found to be greatly enlarged, as well as lymphoid structures in the nose and throat. As the child grows the gland instead of becoming atrophic as it should normally, maintains its size. The spleen and lymph nodes are enlarged so that they can be palpated. Rachitis often accompanies status lymphaticus.

Diagnosis.—This can be made from the enlarged thymus and palpable lymph nodes together with enlargement of the tonsils and adenoids. The x-ray is of value in making a diagnosis since the thymus as well as enlarged bronchial lymph nodes can often be detected by this means.

Prognosis.—While in itself this condition is not serious sudden death frequently can be traced, post-mortem, to the status lymphaticus. Death from a slight operation as an exploratory puncture or hypodermic injection has been explained by this condition.

Treatment.—There is no known treatment at present although the x-ray and its ability to cause shrinkage of lymphoid tissue has caused a diminution in the size of the thymus, and has aided cases where asphyxia from pressure upon the trachea was a serious complication.

ACUTE ADENITIS.

This inflammatory condition of the lymphatics is quite common. It is usually caused by an infection, or an abrasion of the skin, permitting an infection in or about the glands affected.

The cervical glands are most frequently affected.

Inflammatory conditions in the nose, throat, ear, the mouth, especially the gums, or on the skin give rise to these swellings.

The axillary glands are frequently swollen, due to septic absorption following vaccination, or when lymphangitis is present.

The glands of the thigh and the inguinal glands are commonly affected, when there are irritations or inflammatory lesions involving the genitals, or the lower extremities.

Pathology.—The glands show swelling and infiltration with inflammatory products. The immediate tissues are usually involved. Very frequently the swollen glands resolve. At other times there is an excessive migration of white cells so that the glands break down and abscess results.

Symptoms.—The glands *per se* may show inflammatory symptoms, such as fever, tenderness, and swelling. It is wise to examine the adjacent parts to be sure that the glands are not a secondary inflammatory condition. For example, in diphtheria the neighboring glands are usually swollen. If the gland only is involved, we have no evidence of reddening or inflammation. When inflammation exists, involving the neighboring tissues, a reddening of the skin takes place. Such cases usually have fluctuations, or soft areas can be made out.

The diagnosis is very easily made.

The prognosis depends on the condition causing the enlarged gland. If tuberculosis exists, the prognosis is bad. The prognosis of acute adenitis in conjunction with acute exanthemata is usually good.

Treatment.—This depends on the cause of the enlarged glands. If it is due to the tonsils, throat or diseased teeth then treatment should be instituted to correct the same. A paracentesis to relieve a bulging drum will usually be followed by a reduction in the swelling of the adjacent glands. Benefit usually follows a thorough application of iodine ointment. The tendency to suppuration can frequently be prevented when iodine is liberally used. Warm poultices and ice-bags are useless. If fluctuation is felt the treatment is surgical. Many cases of sup-

puration involving one gland can be relieved by aspirating the pus or by making a stab wound.

CHRONIC ADENITIS.

Not infrequently we meet with children who have swollen glands lasting months and years.

This is usually due to repeated attacks of inflammation following acute adenitis.

Pathology.—The glands show an increase in their cellular and connective-tissue elements. They undergo a true hyperplasia.

Symptoms.—The symptoms consist in a swelling of the glands without inflammation or tenderness. In chronic adenitis the glands do not break down; hence suppuration is absent. In conjunction with chronic enlarged glands, we find hyperplasia of the tonsils, so that we invariably have enlarged tonsils and adenoids in such conditions.

Diagnosis.—To exclude tuberculosis the cutaneous Pirquet test should be made. (See article on Tuberculin Test, page 562.) If the result is negative a Wassermann test should be made to exclude syphilis. If we are dealing with enlarged glands involving the neck, then the throat, nose, ears and gums require careful examination to exclude disease. Sinus infections, suppuration of the antrum of Highmore, and cerebellar abscess may persist for many months causing enlarged glands. We must therefore exclude adjacent inflammatory conditions before making our final diagnosis.

The prognosis is usually very good.

Treatment.—The treatment consists in removing the cause. Middle-ear inflammation, scalp disease, and pediculosis should be vigorously treated. Adenoids and diseased tonsils should be removed. Thus the treatment is narrowed down to removing the cause if possible and relying on restorative treatment, fresh air, and good nutrition. A sleeping porch is advisable.

TUBERCULOUS ADENITIS.

This condition is due to an invasion of the tubercle bacillus, resulting in a tuberculous manifestation of the glands. The cervical ganglion of the pharynx and tonsils seem to be the point

of entrance, as the glands in the cervical region are usually affected.

Pathology.—The glands undergo a caseous degeneration which frequently results in abscess. At times we meet with tuberculous lesions in various organs of the body. In the glands we note that they are studded with miliary tubercles and also find the tubercle bacillus therein.

Symptoms.—The glands enlarge in various parts of the body; most frequently the cervical glands are affected. It is usually a very slow process, extending over months; sometimes years. During this time, from the long-continued inflammation, evidence of a continued illness is shown. When these abscesses form they heal very slowly and frequently leave sinuses or ragged scars.

Henry G., 2½ years old, was brought to my children's service with a history of recurring swelling on both sides of the neck and also behind the ear. The child was bottle-fed during infancy and had always suffered with dyspeptic trouble and constipation. He had had furunculosis of the scalp, which necessitated incisions, during the second year. Was troubled with tonsillar and catarrhal trouble; also double otitis.

The glands of the neck were swollen and frequently broke down and discharged pus. The temperature was not elevated. This suppuration is known as the *cold abscess type*. The general condition was fair. A restorative diet of cereals, cream, butter, eggs, etc., was ordered. Attention to hygiene and out-door life was the most important part of the treatment.

Diagnosis.—This can easily be made when we consider the character of the glandular swelling, their tendency to caseation, and to suppuration. When the pus is examined, tubercle bacilli are invariably found.

Differential Diagnosis.—In the beginning this disease is difficult to diagnose. We can exclude syphilis by making a Wassermann reaction. In Hodgkin's disease the glands do not suppurate. In simple chronic adenitis there is no suppuration.

Treatment.—Heliotherapy consisting of exposure to the sun's rays, and hardening of the body by living an out-door life gives the best results. A sleeping porch with a southern exposure summer and winter is the best means of throwing off this infection. Such children should be well blanketed to insure comfort.

Unless contraindications such as a bad heart or feeble pulse exists we should stimulate the circulation by giving a warm

bath followed by a cold shower every morning. The diet should consist of restorative foods in which proteins and fats abound. Restorative medication, such as iron, codliver oil, iodide of sodium,



Fig. 216.—Tuberculous glands of the neck, behind which diseased tonsils and adenoids were found. Pirquet cutaneous reaction positive.

and arsenic, and syrup of iodide of iron are the most useful drugs to be considered.

Read also the treatment outlined in the chapter on Acute Miliary Tuberculosis.

The surgical treatment of tuberculous adenitis should consist in the total removal of the suppurating glands, using aseptic

precaution, rather than to rely on slow spontaneous evacuation of pus by Nature.

MUMPS (SPECIFIC PAROTITIS).

This is an acute infectious disease with slight rise in temperature, and is characterized by a swelling and tenderness of the parotid glands.

Etiology.—This disease is prevalent all over the world, occurring usually in the form of local epidemics. It is more marked during the cold and wet seasons than in the summer. Children between the fifth and twelfth year are most frequently affected. Infantile parotitis is occasionally met with. The nursing infant is not exempt from this condition.

The period of incubation, counting from the exposure to infection and the appearance of the disease, varies from fourteen to twenty-five days. It is usually about three weeks.

Children suffering from mumps are excluded from school until the swelling has entirely subsided. Children in the family who have had the disease may remain in school.

Contact seems to be the method of conveying the disease from person to person. School children and families are thus infected.

Pathology.—From a study of a large number of cases of mumps seen during my service at the Willard Parker Hospital, it was found that the point of entrance was probably Steno's duct. Cultures taken from the mouth and throat during an epidemic did not reveal a specific bacterium which could be regarded as a factor in this disease. The blood examination has shown a mild leucocytosis (10,000 to 12,000 leucocytes). All blood cultures taken were negative.

Symptoms and Diagnosis.—The characteristic symptom of the disease is swelling, and in many cases tenderness, of the parotid glands on one or both sides. The swelling occupies the space behind the angle of the jaw and under the ear, spreading forward on the cheek, and downward along the neck. The center of the swelling is immediately under the lobe of the ear. The edge is ill defined, and the swelling itself is doughy to the touch.

Fever may range between 100 and 101 degrees. Susceptible children may show a much higher temperature. When a temperature of 104° F. accompanies mumps then we should always be suspicious of some complication in addition to the parotitis.

In many cases the swelling becomes so extreme and the pain so acute that the patient can hardly do more than separate the jaws. Mastication is so painful that the child refuses food. The submaxillary gland on the same side becomes affected within a day or two and there is a large swelling below the jaw. Soon afterward the opposite parotid and submaxillary glands may also become involved. Goodhart states that a swelling of the cervical lymphatic glands may be the only local sign of mumps.

There is usually a general malaise. The swelling lasts four or five days and then subsides. Suppuration never results. The amount of saliva secreted is not lessened. In many cases it may be excessive.

Differential Diagnosis.—The glandular swelling in mumps has frequently been mistaken for scarlet fever or diphtheria. In the latter disease the parotid glands are not affected. The patient rarely encounters difficulty in opening the mouth, even when the cervical lymph glands are enlarged. The differential diagnosis between mumps and diphtheria must be made by a careful inspection of the fauces and tonsils and noting the presence or absence of membrane.

In every case of parotitis the ears and the mastoids should be carefully examined to exclude ear complication. In all cases of enlarged glandular swellings we should bear in mind that syphilis may be present. It is well to inquire how long before this acute manifestation, glandular swellings existed. If such glands persist despite local treatment then we are justified in taking a Wassermann test to determine whether or no syphilis is present.

Prognosis.—This is usually favorable. Amongst hundreds of cases admitted to the Willard Parker Hospital, and many more seen in private practice not one death occurred. When death followed a suspected case of mumps some time ago, the post-mortem showed diphtheria as the cause of death.

Complications.—In the male child we frequently have orchitis. One or both testicles will swell and be very tender on palpation. The swelling may increase so that the whole scrotum will be distended. This condition is very painful and is accompanied by fever, rarely chills. Improvement is not to be expected before one or two weeks.

Treatment.—In some cases the swelling of the testicle is greatly relieved by an ice-bag. If however the pain is more marked after the application of an ice-bag, a warm, moist ap-

plication such as flaxseed may be used, or dry heat is sometimes soothing and may reduce swelling.

To relieve the tenderness of the swelling in the neck gentle massage with belladonna ointment, or an ointment consisting of:

℞ Atropine sulphate 1 grain.
Vaseline 1 ounce.

M. ft. unguentum. To be applied three times a day.

Local applications such as ice-bag or warmth will relieve the swelling.

During the course of this disease the food should be liquid, such as gruels, milk, thin farina or cornstarch pudding, puréed vegetables and fruit juices.

Internal treatment is unnecessary although we should always keep the bowels open with the aid of a laxative if necessary. Water and fruit juices should be given to stimulate the kidneys.

V.

ENDOCRINOLOGY AND DISEASES OF THE DUCTLESS GLANDS.

THE field of endocrinology is one in which a great deal of advancement has been made in the last five years, and is one in which the possibilities for further advancement furnish perhaps more hope than any other branch of medicine. At the same time a word of caution should be spoken in accepting scientifically unproven statements, with which the literature is at this time flooded. Especially in pediatrics should discretion be exercised in using remedies whose value is questionable. Many preparations of the various glands of internal secretion are on the market, and some no doubt have their uses, but unless the practitioner is fully aware of the contents of the preparation he is using, and is likewise certain of the condition in his patient for which he is administering treatment, he should proceed with great caution before prescribing any one of them.

Much is heard of pluriglandular syndromes. In a child which has not reached maturity, it seems to the author that it is very unscientific and inaccurate to place it in a class of, for example, hyper-pituitary and hypo-adrenal. In adults there may be a basis for classifying persons under various syndromes, but in children, the efficacy is very questionable.

If we were to enumerate the conditions in which gland therapy is indicated positively we would find that they were surprisingly few. The most common conditions that we see are cretinism and myxedema. These conditions are different expressions of the hypo-functionating thyroid gland. The clinical picture of these is generally very characteristic, and their diagnosis simple. Obviously the treatment is to supply the missing secretion. This can readily be done by giving thyroid in any of several forms. But this supplying a deficiency of a gland by giving gland substance cannot be applied as yet to other glands. No other single gland gives the picture of deficient secretion clinically, that the thyroid gland does.

The comparatively rare condition, diabetes insipidus, is classed as an endocrine disorder. The pituitary gland is at fault,

but which lobe of the gland is to blame is in doubt. At any rate the administration of posterior lobe of the hypophysis has benefited the condition and lessened the polyuria in the cases that have come to my notice.

Further than the above mentioned conditions, none at present to my mind warrant treatment by gland extracts. Suprarenal therapy is questionable, and of a certainty we should not administer extracts of sex glands to small children.

Until we know more about the interrelationships of the endocrines and how they compensate for any of each other's deficiencies, the best advice is not to try to use their extracts or the glands themselves blindly. Experimental medicine will in due time clear up much of the present vagueness on the subject and lead the way to intelligent therapy.

THE THYMUS GLAND.

This long lobulated gland is similar in structure to the salivary glands. It lies in the anterior mediastinum, immediately behind the manubrium of the sternum. The thymus reaches its full development during the second year, after which it gradually disappears. The function of the thymus is still a question. Tuberculosis involving the thymus gland is occasionally reported in current literature.

DISEASES OF THE THYMUS GLAND.

In rare instances the thymus gland may persist until the twentieth year or even later in life. When such a condition exists, mechanical pressure has caused dyspnea of a serious nature. Asthma has been reported by some clinicians in which an enlarged thymus was found; hence the term "thymic asthma." Sudden death has occasionally been caused by an enlarged thymus. This has been especially noted in children with rickets. Abscesses have been reported in the thymus by Dubois. Syphilis and tuberculosis have rarely been found.

Reich says the absolute dullness of the thymus, as determined by light percussion, is irregularly triangular in outline, the base being made by the outline connecting the two sterno-clavicular articulations, the blunt apex situated at the level of the second rib or slightly below it, and the sides a little beyond the edges of the sternum. The larger half of this triangle of dullness usually falls to the left side. When the limits of dullness, as

given above, vary by one or more centimeters, or obscure the pulmonary resonance between the upper line of cardiac dullness and the lower lateral limits of thymus dullness, an enlargement of the thymus is probable. The thymus dullness is present until the end of the fifth year, after which it is inconstant.

Diagnosis.—The diagnosis of diseases of the thymus gland is frequently impossible. An infiltration or swelling of the area surrounded by the thymus gives rise to symptoms of dyspnea, from pressure upon the pneumogastric nerve. The same symptoms are also found when the thymus itself is enlarged. When the lymph glands in the anterior mediastinum are swollen, dullness on percussion is rare unless there is a cheesy infiltration of the lymph glands, according to Reich.

Treatment.—Symptomatic treatment only should be instituted. The iodide of sodium in very large doses may be tried.

CRETINISM (MYXEDEMATOUS IDIOCY—MYXEDEMA).

Cretinism is a form of idiocy associated with pachydermatous cachexia.

Etiology.—In my own cases psychical disturbances in the mother during pregnancy seemed to result in cretinism. Worriement and fright seemed to have some etiological relationship to the development of myxedematous idiocy.

In two cases of mine the mother suffered with mental depression, constant worry, and hysterical symptoms during pregnancy.

Pathology.—We are indebted to Fletcher Beach for a series of careful post-mortem investigations which have thrown considerable light on the nature of this disease. We know that cretinism is due to the absence of the internal secretion of the thyroid gland. In some instances the gland is congenitally absent. This condition also results when the thyroid gland is removed by surgical means. It is safe, therefore, to assume that the loss of the function of the thyroid gland causes cretinism.

Holt believes that cretinism is in some instances associated with goiter. This disease occurs sporadically in our country.

Symptoms.—The characteristic manifestations are very apparent during the first year of a child's life. Sometimes distinct evidences of cretinism can be seen as early as the third month after birth. The child is short in stature and light in weight com-

SPORADIC CRETINISM.

Fig. 217.—Child. Age 2 years, 2 months.

Fig. 218.—Same child. Seven months after continued thyroid treatment.

Fig. 219.—Same child. Age 3 years, 9 months. One year and seven months after continued thyroid treatment.



Fig. 217.



Fig. 218.



Fig. 219.

pared with the normal infant. The extremities, particularly the fingers, are short and thick. The lips are thick. The tongue is broad and thick, and constantly protrudes from the mouth. The fontanel is late in closing. The nose is broad, flat, and upturned. The nostrils are wide open. The hair is coarse and straight (straw-like). Dentition is delayed, and when the teeth do appear they are very poorly formed. The skin of the entire body is thick and dry, but does not pit on pressure.

The infant is stupid, and it is very noticeable that we are dealing with *deficient mental development*.

In the supra-clavicular regions there are regularly formed pads of fatty tissue, so that the neck is short and thick (Tuttle). The thyroid gland cannot be felt unless it contains a tumor. The abdomen is large and prominent and an umbilical hernia is frequently present.

Constipation of a very obstinate character is usually met with and persists for a long time. The temperature is subnormal. The thyroid gland is absent or cannot be felt. In palpating the thyroid region we can feel the trachea. In some cases there is a hypertrophied hypothenar eminence on the palms of the hands. The face in all cases has the prognathous expression (Koplik).

Diagnosis.—The value of an early diagnosis in this condition is more important than in any other disease with which we are brought in contact. The diagnosis can usually be confirmed after a short period of thyroid treatment. The specific results of treatment are more apparent in this condition than in any other infantile derangement with which we are confronted.

CASE I.—Frances P. was referred to me. She was the seventh child of this family. All the other children were perfectly normal. The labor was normal. The child was born before the doctor arrived.

Family History.—The father is healthy. The mother is strong and healthy. During the pregnancy the mother constantly cried on account of family trouble. Her husband was out of work. The mother frequently had hysterics. Similar psychical disturbances were never present while pregnant with the six other children, who are all strong and healthy.

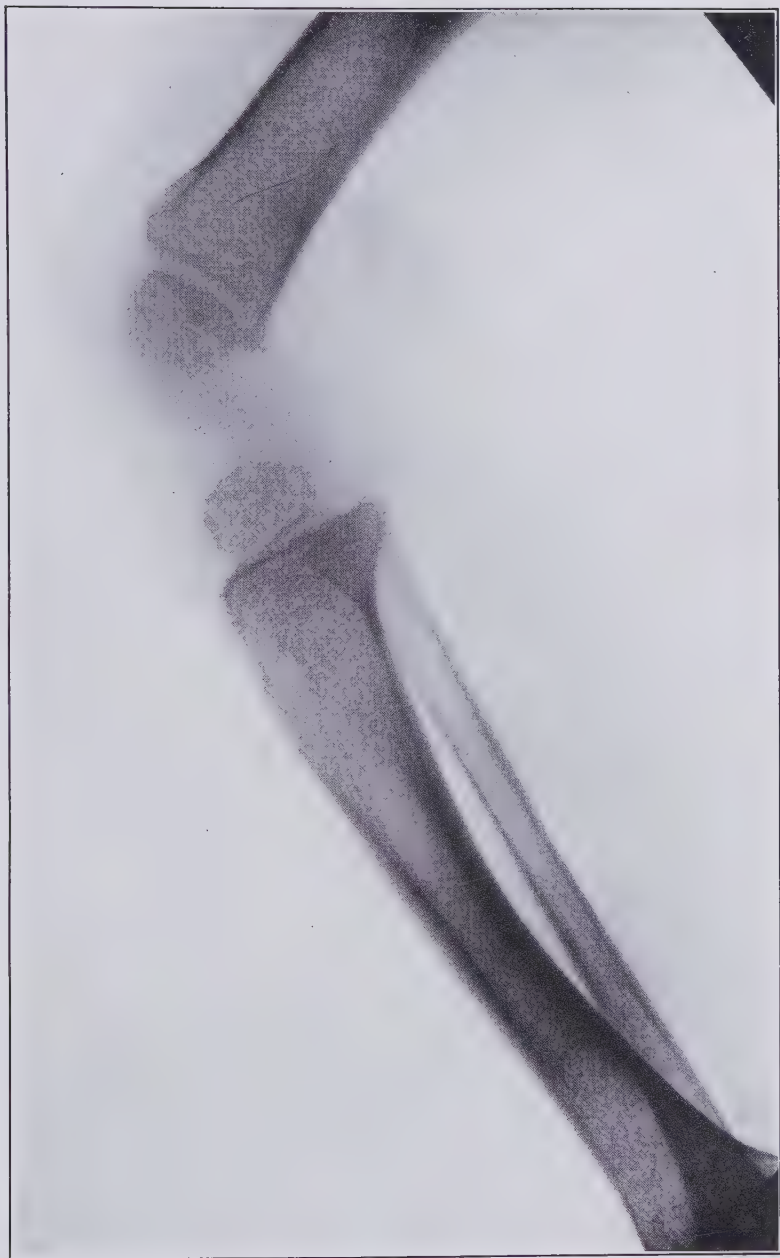
History Given by the Mother.—The mother noticed that the child had short limbs. That she was not bright mentally. That when 1½ years old she could neither walk, talk, nor support her head. The tongue was very thick and protruded almost constantly while awake, as well as when asleep. The hair did not grow. The nose was short and flattened. The skin was yellowish and dry. The child had a jaundiced appearance. Constipation since birth. The bowels were moved with difficulty. The infant was

PLATE LXIII



Cretin. Seven years old. Has four tarsal bones. In a normal child all should be present at the age of four. For the carpal bones see Plate XIII, Vol. I.

PLATE LXIV



Cretin. Seven years old. No sign of the patella which normally appears between the third and fourth year.

breast-fed until it was fifteen months old. Up to this time there was no sign of dentition. She was taken to the Babies' Hospital, which necessitated her being weaned from the breast. She remained in the hospital about two weeks. When sixteen months old, one month *after thyroid treatment* was commenced, the first tooth appeared. The child was successfully vaccinated at the end of the first year.

During its first year and up to the time that it was taken to the hospital, it did not suffer with any infectious disease.

The child was 2 years, 2 months old when first seen by me. The following conditions were found:—

The child could neither walk nor talk. The tongue was very thick and protruded constantly. The lips, the eyelids, and the skin of the face were thickened, coarse, and rough. The nose was short and flat. The skin had a yellowish jaundiced appearance. The fontanel was widely open both anteriorly and posteriorly. The face was broad and the eyes were set very wide apart. There was a marked depression on each side of the temporal bone. There was a marked frontal protuberance. The child had nine teeth when twenty-two months old. As previously stated the first tooth appeared one month after the thyroid treatment was commenced, or when the child was sixteen months old. The body was well developed—fat. There was no evidence of rachitis. The chest and spine showed evidences of good nutrition. The length of the body was 50½ centimeters, or about 20 inches. The secretions of the body were very torpid. Constipation of a very obstinate form was encountered. There were several fatty growths in the sterno-cleido-mastoid muscle.

The child had a violent fear of water, so much so that the mother had difficulty in bathing her. The hair was very thick and straw-like. The thyroid gland could not be felt.

The pulse was 90 and of a full bounding character. There was a sub-normal temperature which was never higher than 98° F. in the rectum in the evening. Respiration was 16 while quiet and 24 while crying. The urine showed traces of indican, evidently due to the constipation. No albumin or sugar was found. Microscopically no uric acid crystals; no casts, and no bacteria were found.

When the treatment was first commenced, 1 grain of thyroid was given three times a day. This dose was rapidly increased so that after the first week the child took 2½ grains three times a day. The heart was carefully watched and no disturbance noted from the quantity of thyroid given. In addition, 10 drops of pure codliver oil was given three times a day. Cereals, milk, chicken soup, broths, and acid fruits, such as oranges, lemons, and cranberries, were ordered. Fresh air and bathing, with vigorous friction, concluded the hygienic treatment. Under this vigorous treatment the child developed very fast. The length of the body was 58½ centimeters at the end of the first month of this treatment. The growth, therefore, in one month amounted to 8 centimeters or 3¼ inches. The obstinate constipation was improved and the bowels became regular. The

teeth have appeared at regular intervals. The facial expression has changed. The child now commences to walk, as also to talk, she says "mamma" and "papa."

The fear of water and to be bathed is past. She no longer cries when she sees water. At the end of 1 year, the length of her body is 85 centimeters or 33½ inches, so that she has grown in 1 year 34½ centimeters or 13½ inches.

The child progressed favorably.

TABLE NO. 66.—LENGTH AND GROWTH OF BODY.

| Age. | Length of Body. | Gain in Growth of Body. |
|-------------------|-------------------|------------------------------------|
| 2 yrs. and 2 mos. | 50½ cm. (19½ in.) | |
| 2 yrs. and 3 mos. | 58½ cm. (23¼ in.) | 1 mo., 8 centimeters (3½ in.) |
| 3 yrs. and 3 mos. | 85 cm. (33½ in.) | 12 mos., 34½ centimeters (13½ in.) |

CASE II.—Rosie H. was first seen by me when she was eighteen months old.

Family History.—Father living, is somewhat dyspeptic. Has no specific disease. The mother is a very nervous woman, otherwise in good health. This is her first child. She has had one other pregnancy of eight months which was still-born, believed to have been an asphyxia neonatorum. No miscarriages. No lues.

Child's History.—She was breast-fed for seven months, later she received equal parts of milk and water. When first seen by me at the age of eighteen months, she was still fed on equal parts of milk and water. There has always been severe constipation, and streaks of blood have frequently been seen in the stool from severe tenesmus. The examination of the child at that time showed coarse, sparse hair, and a very rough skin. The tongue and the lips were very thick. The tongue always protruded from the mouth; breathing was difficult. There was constant snoring, and the mouth was always open. The thorax was decidedly rachitic; there was a funnel-shaped depression, and also a kyphosis and an umbilicated hernia. The child could neither stand nor talk. There was no evidence of teething. The appetite was poor. The temperature was sub-normal, 98½° in the rectum. The pulse was 100, small, and feeble. The heart sounds muffled. A hemic murmur was plainly heard at the apex and also in the vessels of the neck. It was impossible to secure a specimen of urine for examination. A drop of blood was examined and showed a decreased number of red blood-corpuscles and a marked leucocytosis. The diagnosis made was *sporadic cretinism*. The circulation was poor and there was a slight edema constantly present. The feet and hands were frequently cyanotic, and always felt cold. The anterior fontanel was widely open. Growth was stunted as the length of the body was only 55 centimeters. The naked weight when 1½ years old was 11 pounds 13

SPORADIC CRETINISM.

Fig. 220.—Child. Age
1 year, 5 months.

Fig. 221.—Same child.
Age 2 years.

Fig. 222.—Same child.
Age 3 years, 5
months.



Fig. 220.



Fig. 221.



Fig. 222.

ounces. When first seen by me there was neither muscular nor bony development which could be considered normal. At eighteen months the child had had no teeth. At twenty-two months the first tooth appeared. The muscles of the body were limp and flabby. The child could not support her head nor was there good support to the spinal column. The patellar reflexes were but slightly present.



Fig. 223.—Cretinism. Age $7\frac{1}{4}$ years. Height $26\frac{1}{2}$ inches. —Front view.

Treatment.—The treatment consisted in giving fresh, raw milk warmed to body temperature. In addition to the milk, steak juice, orange juice, potato flour, and the usual antiscorbutic remedies were ordered. Fresh albumin, using the raw white of egg, and vegetable proteins, such as pea soup, and lentil soup, were very well assimilated.

The medicinal treatment consisted of two drugs. Thyroidine was given in doses of $\frac{1}{2}$ grain three times a day, and gradually increased until 3 grains were given three times a day. The other drug was Fowler's solution given in 1 drop doses, increased to 3 drops three times a day. It

is now about six months since the treatment was commenced. The child has grown in length from 55 centimeters to 69 centimeters and the weight has increased from 11 pounds 13 ounces to 17 pounds.

CASE III.—Rosie N. was first seen by me when seventeen months old.

Family History.—Father is healthy. No family history of tuberculosis, syphilis, or any other taint. The mother is in good health and has never



Fig. 224.—Cretinism. Age $7\frac{1}{4}$ years. Height $26\frac{1}{2}$ inches. Back view.

had any serious illness or miscarriage. This was her first pregnancy. The mother's condition was good, there was no traumatism nor any psychic disturbance. The infant was born without the aid of instruments. It was a perfectly normal delivery. The mother menstruated while nursing the infant.

Personal History.—The infant was nursed about sixteen months. She did not seem to thrive since she was three months old. Severe constipation had always existed, and was present when I first saw her. She could neither stand, walk, nor talk. Backwardness in development was very ap-

parent. Spasmus nutans was present. The fontanel was widely open. She showed no signs of intelligence. The hair was coarse and straight. The extremities were short. The growth stunted. She presented a squatty appearance. The skin was rough, thickened, and large eczematous patches covered the arms and legs. The lips were thick. The tongue was thick and



Fig. 225.—Cretinism. Same case. Age 8 years. Height $33\frac{1}{4}$ inches, gain $6\frac{3}{4}$ inches.

protruding. She had two lower incisors; no other evidence of dentition. The facial expression was senile and corresponded with that of a typical cretin. She was restless by day and suffered with insomnia by night. The urine was examined and contained no albumin nor sugar. Slight traces of indican were seen, microscopically nothing pathological. The

blood examination showed four million six hundred and twenty thousand (4,620,000) red blood-corpuscles, and seven thousand two hundred (7200) white cells.

The percentage of hemoglobin taken with Gower's instrument was about 40 per cent.



Fig. 226.—Cretinism. Same case. Age 8 years. Height $33\frac{1}{4}$ inches, gain $6\frac{1}{4}$ inches. Back view.

Equal parts of milk and barley water were fed every few hours. Thyroid treatment was commenced; $\frac{1}{2}$ grain of the desiccated powdered thyroids was ordered three times a day. The dose was gradually increased and the child now receives 3 grains three times a day. There was no cardiac disturbance from this dose.

Lemon juice, orange juice, raw albumin, and vegetable soups were ordered. The child's condition improved. The specific effect of the thyroid was very apparent.



Fig. 227.—Cretinism. Same case. Age 9 years. Height $37\frac{3}{4}$ inches, gain $4\frac{1}{2}$ inches. Front view.

CASE IV.—Gussie S., 7 years and 3 months old when she came under my observation. She is the oldest of four children. The other children are to all appearances healthy, as are also the parents.

Family History.—The mother claims to have had a severe fright during her sixth month of pregnancy, and attributed the child's mental deficiency to this psychical disturbance. There is no history of any condition similar

to this child's on either side of the family. Parents are natives of Russia. They are 13 years in this country, and do not know of any such disease in their native country. The parents are not related.



Fig. 228.—Cretinism. Same case. Age 9 years. Height $37\frac{1}{4}$ inches, gain $4\frac{1}{2}$ inches. Back view.

Feeding.—The child was breast-fed for about two years. She did not receive any other food during this period. When the child was thirteen months old the mother's menstruation returned. The mother continued to nurse the child until the end of the second year, although she continued to menstruate every month.

Nothing unusual was noticed about this child until the end of her first year. She cried very little and slept a great deal. At about 1 year of age parents noticed that she differed from other children of the same age. No

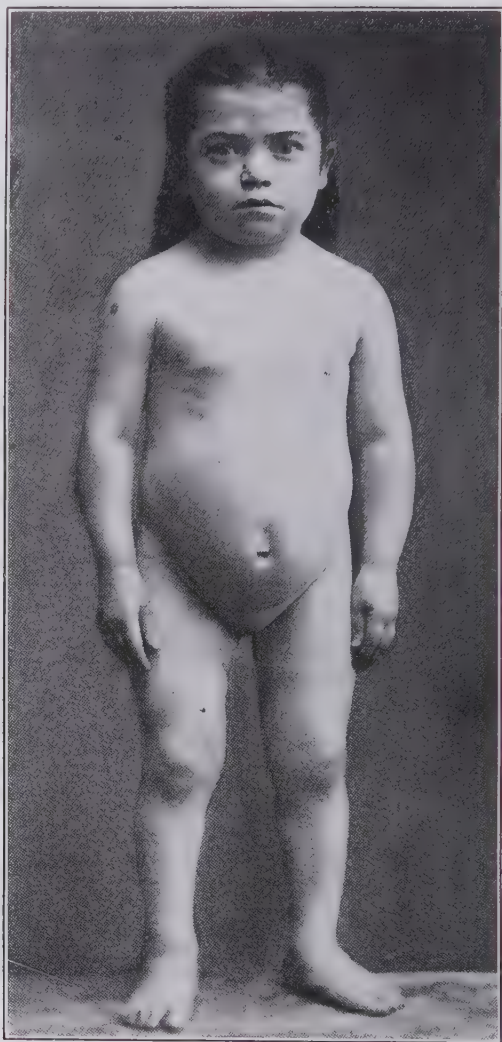


Fig. 229.—Cretinism. Same case. Age 11 years. Height $39\frac{1}{4}$ inches, gain 2 inches. Front view.

teeth appeared. She made no attempt to walk or stand. Never laughed or smiled, was always apathetic and took no interest in her surroundings. There was no appreciable growth in height from 1 to 7 years. The same

dresser always fitted her. In her fifth year she was for a period of six months very cross and restless, but this disappeared as it came, without any known cause.



Fig. 230.—Cretinism. Same case. Age 11 years. Height $39\frac{3}{4}$ inches, gain 2 inches. Back view.

She cut her *incisor teeth* at 3 years of age and the rest at 4 years. She has never had convulsions or any other sickness except measles when 4 years of age. She began to stand on her feet with assistance when 3

years old. She did not speak a word until 5 years old, from which time till I took charge of her she could say no more than "papa" and "mamma."

When she came under my observation, she was $26\frac{1}{2}$ inches high. She weighed $25\frac{1}{3}$ pounds and was quite stout in proportion to her height. Her head was large in proportion to her body. The lips were thick. The nose flat and depressed between the eyes. The neck was very short. No sign of enlarged thyroid, large blue eyes, teeth in fair condition, complexion dark, hair dry and of a rusty black color.

Hearing, sight, and smell apparently good. Voice not out of the ordinary. The extremities were short and thick, lower ones were bow-legged. The ends of the bones were large. The belly was large and its prominence exaggerated by a decided anterior curvature of the spine. Intelligence was almost *nil*, temperament very irritable, does not cry, but becomes very angry. She never asks for food, eats little and only what is given to her. The bowels were constipated, moving only once in two days. She never asked to pass stool or water. Had external hemorrhoids, which bled occasionally. When awake was constantly sitting. Cannot walk alone and only a few steps when assisted. She slept well. Pulse was 96 and regular.

Has had no treatment for three years. Previous to this time parents had been all over with her and tried everything suggested, without avail.

I put her on three grains, once a day, of desiccated thyroids (Parke, Davis & Co.). The dose was increased to 4 grains daily, but after a week the dose had to be reduced to two grains, as the pulse rose to 120 and the child became irritable. Otherwise, some improvement was already noted in her general condition; she could stand better and moved her bowels daily. After another week the dose was increased again to 3 grains daily and was continued so till I saw her two weeks later when I found her pulse 144, strong and bounding. She had become considerably thinner, having lost $1\frac{1}{2}$ pounds in weight in spite of the fact that she had gained 2 inches in height. This gave her a much more natural appearance. She also had a more intelligent facial expression, talked more and decidedly better, walked a short distance without assistance, and ate better.

On account of the accelerated pulse and loss of flesh, I decreased the thyroids again to 2 grains daily. From this time on there was a gradual improvement in all the symptoms. She gained in intelligence, spoke more and articulated better. The dose of the thyroids was gradually increased until she was taking 5 grains daily, which she continued for more than a year and a half without any symptoms of intoxication.

If any proof be necessary as to the efficacy of the thyroid principle in cretinism, or as to the thyroid gland and its secretion being essential to the proper physiological workings of the human body, the history of this case supplies it. Take the one symptom of stature. From 1 to 7 years of age, without the administration of thyroids, there was no increase. From 7 to 8 years, with thyroids, there was a growth of $6\frac{3}{4}$ inches. From 8 to 9 years, also with thyroids, there was a growth of $4\frac{1}{4}$ inches.

From 9 to 10 years, without any thyroids, there was no growth. From $10\frac{1}{2}$ to 11 years, with thyroids again, 2 inches were gained. All other manifestations of this cretinic condition underwent corresponding fluctuations with the administration of the extract, but changes in stature being the most evident, serve best to illustrate the progress of the case.

To contrast her previous with her present condition as well as to show her appearance during the period of her improvement no better means could be utilized than the accompanying photos.

She is now sufficiently intelligent to go to school. She plays as a child should and her general health is very good. She has yet the physical marks of her previous condition in the peculiar features, the short neck, and the spinal curvature with the abdominal prominence, though they have all improved, especially the spine and the abdomen. Her height is about 12 inches short of what it should be at her age, 11 years, but if the rapid rate of growth continues she will gain a good part of it.

When last seen, the mother stated that the girl had been going to school for the last two years. Very little mental progress has been made during this time. She reads an elementary primer and can remember figures. Has taken thyroid but four months out of the last sixteen months. Her height is $43\frac{1}{4}$ inches. She has gained in the last sixteen months about two inches. Her pulse-rate is 72.

Prognosis and Course.—The sooner treatment is instituted the better the result. When this condition is neglected, children become worse and worse until finally they are beyond medical aid.

It must be borne in mind that thyroid must be given for years if lasting results are to be obtained. Children will go backward at once if we discontinue our treatment, even though the same has been continued for some years. An interesting study is the continuous growth including mental development plainly seen in the illustrations of cases in this chapter.

Treatment.—The most important part of the treatment consists in administering from 1 to 5 grains of the desiccated extract of thyroid. This replaces the active principle of the normal thyroid gland. I have used with very good success thyroïdin, from $\frac{1}{2}$ to 2 grains three times a day, with equally good results.

Great care should be taken to watch the pulse-rate while giving thyroid. The pulse will sometimes increase from twenty to forty beats after the administration of 1 or 2 grains of thyroid. The moment we find an exaggerated pulse-rate, it will be necessary to reduce the dose of thyroid at least one-half. A flabby, fat

child will at once lose weight, and an important feature of successful treatment is an increase in height.

Thyroid Implantation.—Implantation of sheep's or lamb's thyroid (heterogeneous), or from the human being (homothyroid), has been advocated by some. In one case of mine, operated by Lilienthal, the implantation of lamb's thyroid was tried. Several pieces were implanted in the peritoneal cavity. Some improvement was noted.

We must not, however, blindfold ourselves to the belief that when we supply the missing internal secretion, namely, thyroid, that we have fulfilled all indications.

The diet must be regulated and the child given a large portion of protein—milk, meat or meat extracts, fresh beef blood or roast beef juice, orange juice, fresh eggs, and all cereals must be given as body builders. Fresh air and a general attention to the hygienic condition of the child are very important. Massage, gymnastics, and exercise should not be overlooked.

If the appetite is poor 1 to 2-minim doses of the tincture of *nux vomica* will do good. Butter and codliver-oil are valuable adjuncts.

EXOPHTHALMIC GOITER (HYPERTHYREA, BASEDOW'S DISEASE, GRAVES'S DISEASE).

This disease has occasionally been seen in children. It is supposed to be due to a hypersecretion of the thyroid gland. Sachs believes that heredity is a more important factor than excitement or fright. Epileptic and alcoholic parents certainly predispose to this condition in children.

Symptoms and Diagnosis.—There are three symptoms of importance which should be noted:—

1. The enlargement of the thyroid.
2. Palpitation of the heart (tachycardia).
3. Protrusion of the eyeballs (exophthalmus).

The blood tension is increased, hence hemorrhages from the nose, stomach, or intestines are quite common. Disturbances of vision due to the exophthalmus are never described. The thyroid enlargement is usually bilateral. Muscular tremors are also noted. The diagnosis is easily made by recognizing the symptoms above described. There is a physiological hyperemia of the thyroid which is entirely different from goiter.

Prognosis.—Cases seen by me have all assumed a chronic tendency. I have never known death to occur directly from this condition. When death occurred it was due to some complication.

Treatment.—Sparteïn sulphate, strophanthus, digitalis or belladonna combined with iodide of sodium may be tried. The galvanic current is strongly advised by some writers. Recently x-ray treatment has been used in conjunction with the above-mentioned drugs. The danger of x-ray dermatitis should be remembered by those having little experience with light treatment.

ACUTE THYROIDITIS.

Inflammatory conditions such as abscess have been described as a complication of the infectious diseases. The migration of streptococci or other pyogenic bacteria may give rise to suppurative inflammation. The treatment is surgical.

ABNORMALITY OF THE THYROID.

Syphilitic gummata and tuberculosis have been found in rare instances. Malignant disease involving the thyroid has been reported among infantile disorders.

DISEASES OF THE ADRENAL GLANDS.

Pathologists have frequently described hemorrhages into the adrenal glands in the new-born infant. Diseases *per se*, excepting cancer, have not been described. There is still considerable to be learned concerning the physiology of these glands.

ADDISON'S DISEASE.

This rare condition is occasionally described. Literature records about twenty cases in all.

Symptoms.—The symptoms of the disease consist of a deep-yellowish or bronzed pigmentation of the skin. It is found on the exposed parts of the body, such as the hands and head. The mucous membranes of the mouth and vagina are also pigmented. White areas of skin are scattered over the body. Vomiting, diarrhea, and nervous symptoms are noted. Anemia is usually very marked.

Diagnosis.—In the diagnosis of this condition it is necessary to exclude pigmentation of the skin due to metallic poisons, such

as argyria, from the internal administration of nitrate of silver. Arsenic and lead have been reported as causative factors of bronzed skin.

Prognosis.—While most authors report the outcome as fatal, some few recoveries have been noted. In a case seen by me recovery took place after several years of treatment.

Treatment.—We have no specific treatment for this condition. Some authors advise the administration of the raw or cooked adrenal glands of the sheep. The dry extract in tablet form has been isolated and 1-grain doses of this extract may be given three times a day. When the gland itself is used, one-half to one gland may be given in twenty-four hours.

The value of hygienic and dietetic measures I regard as more important than medication.

PART IX.

Diseases of the Brain and Nervous System.

I.

FONTANEL.

THE posterior fontanel is usually closed at the end of the second month. The anterior fontanel normally closes between the sixteenth and twentieth months. If the fontanel is open at the end of the second year, then rickets or other abnormality may be considered. A fullness of the anterior fontanel and bulging of the same at the end of the second year is pathological. (See chapter on Hydrocephalus.) Premature closure of the fontanel frequently occurs in microcephalus and also in congenital idiocy. This premature closing interferes with the proper growth and development of the brain.

Shape of the head.—Peculiar shapes of the head are met with under perfectly normal conditions. An interesting study is the series of outline sketches of the head which show the modifications in form produced by labor and also the normal sketches of the head.

Circumference.—The average circumference of the head at birth in 446 full-term infants taken in about equal numbers from the Sloane Maternity Hospital and New York Infant Asylum, was as follows:—

| | |
|--|-----------------------------------|
| Average circumference of the head, 231 males | 13.90 in. (35.5 cm.). |
| Average circumference of the head, 251 females | 13.52 in. (34.5 cm.). |
| Total | 446 infants 13.71 in. (35.0 cm.). |

Auscultation of the Anterior Fontanel.—A bruit is occasionally heard over the anterior fontanel. It is a blowing sound similar to that heard in the vessels of the neck during anemia or in chlorotic girls. I have described this condition in the chapter on Rachitis.

PERCUSSION OF THE SKULL.

MacEwen's Sign: MacEwen, in his treatise upon the pyogenic infective diseases of the brain and spinal cord, says:

(871)

OUTLINE SKETCHES OF THE HEAD, SHOWING THE VARIOUS DIAMETERS.

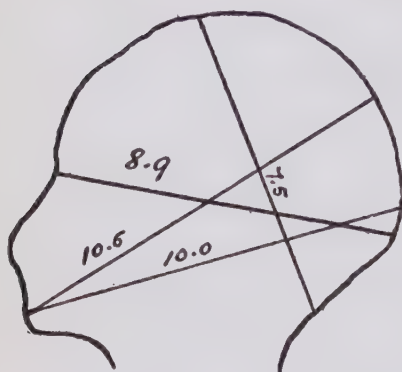


Fig. 231.—Sagittal section of normal head of seven and one-half months' fetus, half natural size. (After Ballantyne.)

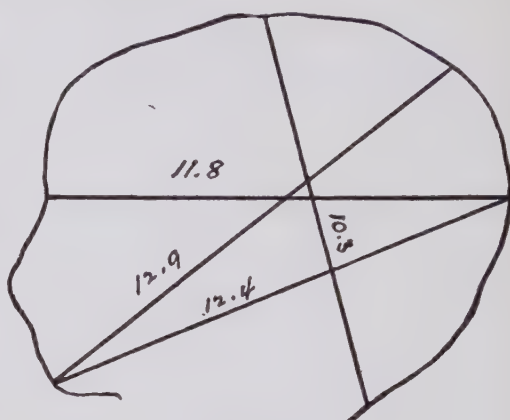


Fig. 232.—Normal head as seen from above, half natural size. (After Budin.)

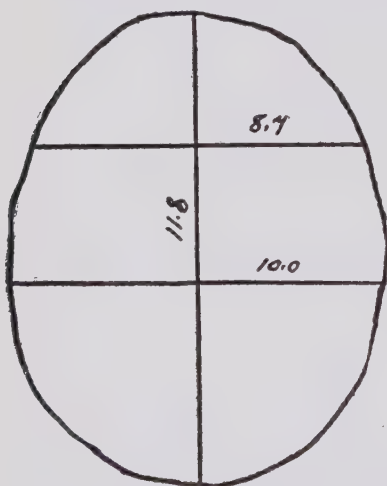


Fig. 233.—Sagittal section of normal head, half natural size. (After Budin.)

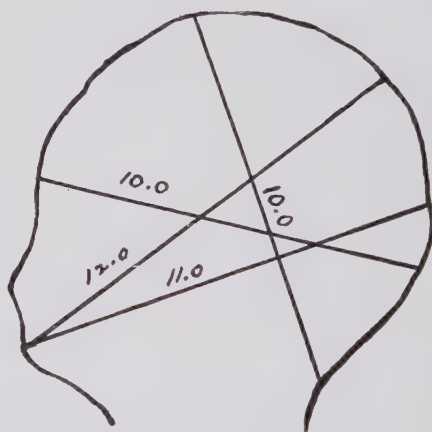


Fig. 234.—Sagittal section of head immediately after normal, easy labor, half natural size. (After Ballantyne.)

When the lateral ventricles are distended with serous fluid, as would be occasioned by cerebral tumors pressing on the fourth ventricle, or by occlusion of the veins of Galen or otherwise, the percussion note is markedly altered, the resonance being greatly increased. Besides the increased resonance, there is an important

OUTLINE SKETCHES OF HEAD OF INFANT, SHOWING THE MODIFICATIONS IN
FORM PRODUCED BY LABOR, ETC.

Fig. 235.—Sagittal section of head immediately after labor (O. D. P. Position). (After Ballantyne.)

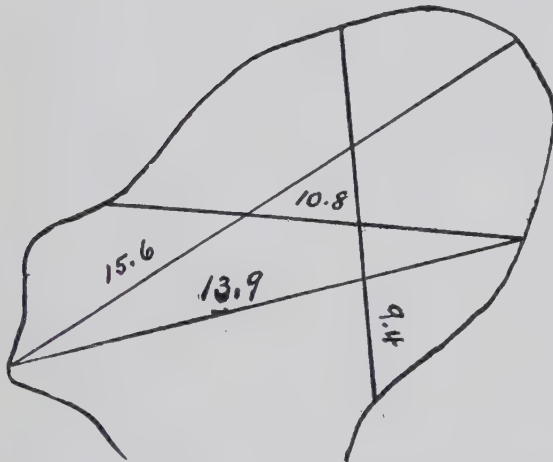
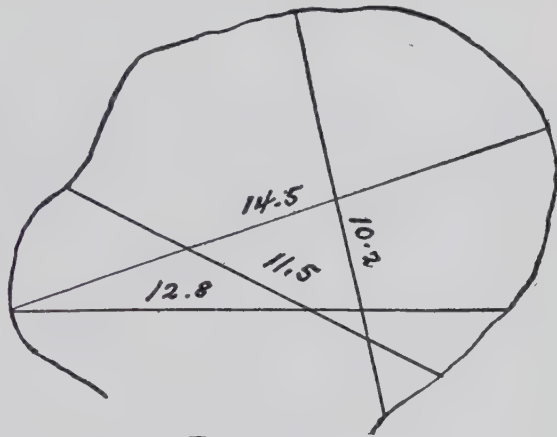
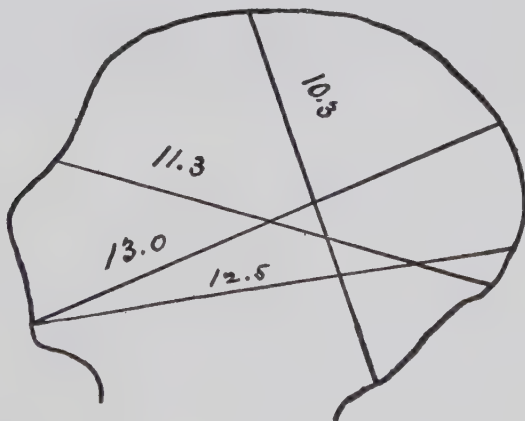


Fig. 236.—Sagittal section of head immediately after labor, half natural size (O. D. P. Position). (After Budin.)

Fig. 237.—Sagittal section of head of infant six days old, half natural size. (After Ballantyne.)



feature which may be demonstrated: The percussion elicited at a given spot on the cranium, such as the pterion, varies according to the position of the head. While the person sits with the head upright, the most resonant note is brought out by percussion towards the basal level of the frontal bones and the squamous portion of the parietal. If the patient hangs his head to one side, so that one parietal is placed fairly below the other, the greater resonance is found on percussion of the lower parietal. Reverse the position and the same note is elicited on the opposite side of the head, which is now the lower, the greater resonance being found at that part of the skull nearest the lateral ventricles, and which for the time is at the lowest level.

These observations tend to indicate that the quantity of this note is not dependent on the mere density of the diameter of the cranium, but to a large extent upon the consistence or arrangement of the intercranial contents relatively to the osseous walls. . . . The exact mechanical quality of the note is difficult to describe, but, when heard, it conveys the idea of hollowness. One such case, in which the above phenomena were clearly marked, was observed to a conclusion. The percussion note was not so clear at first as it ultimately became, the resonance increasing, as the disease advanced.

In tumors of the cerebellum it is an aid to diagnosis, and when present with abscess it points to an involvement of the cerebral fossa.

THE BRAIN.

In the newly-born the dura mater is closely adherent to the skull, so that extravasations between the dura mater and the skull are unknown.

Fluid in the Subarachnoid Space.— In infancy and childhood more fluid is found in this space than in adult life. McClellan believes that hydrocephalus due to an excessive amount of fluids in the ventricles of the brain may be caused by the closure of a small opening in the pia mater which is found at the inferior boundary of the fourth ventricle known as the foramen Magendie.

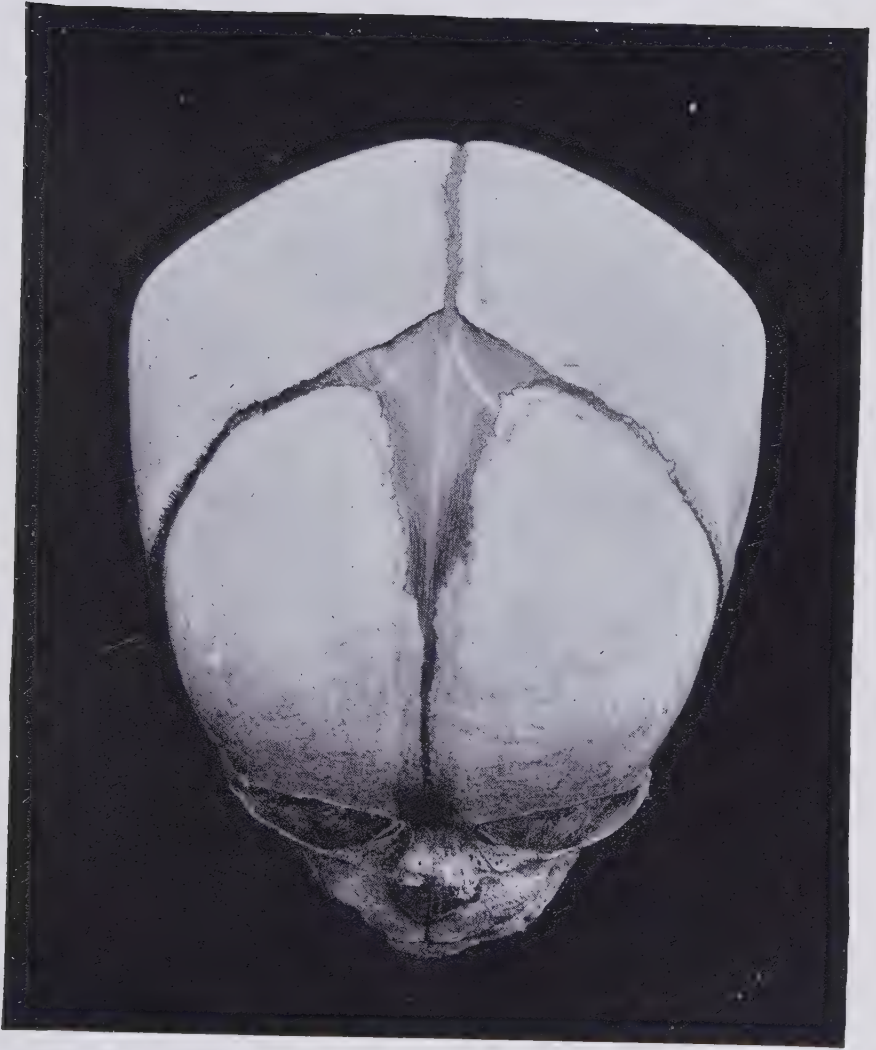
Blood-vessels of the pia mater are so delicate that blood pressure, traumatism, etc., may cause hemorrhage into the subarachnoid space, resulting in monoplegia, hemiplegia, or diplegia.

PLATE LXV



Fetal skull, showing the anterior fontanelle and the coronal and frontal sutures.

PLATE LXVI



Fetal skull, showing the anterior fontanelle and the frontal, coronal, and sagittal sutures.

PLATE LXVII



Fetal skull, showing the posterior fontanelle and the lambdoidal and sagittal sutures.

Growth and Development of the Brain.—From birth until the seventh year is reached the brain grows very rapidly; after the seventh year the growth is slow.

Weight of the Brain.—The weight of the brain of the newly-born infant is one-third that of the adult. In male and female children it is approximately the same at birth, although later on the male brain grows more rapidly than the female. When a child is between 7 and 8 years of age, the brain reaches the adult size and weight. There is from this time on a slight increase in the weight up to the twenty-fifth year.

Vierordt states that the increase of the brain after the seventh year is due to an increase in the thickness of the cortex and in the size of the cortical constituents.

Difference Between Infantile and Adult Brain.—The fissure of Sylvius in its relation to the spherio-parietal and squamous sutures occupies a higher position in childhood than in later life. Symington and McClellan, in studying frozen sections of the brain of children under 7 years of age, found the Sylvian fissure above the squamous suture and covered by the parietal bone.

Fissure of Rolando.—The position is the same in the infant as in the adult.

The Cerebellum.—This is much smaller in the child than in the adult in comparison with the cerebrum.

The convolutions of the brain are more shallow in the infant than in the adult. The depressions or sulci between the convolutions are not so deep in the infant as in later life. *The special centers of the brain* are not fully developed in the infant.

REFLEXES.

Excess of Reflex Action.—In acute mania, in cerebritis, and in acute meningitis we have excessive reflex action. In chronic hemiplegia an increase of the reflexes associated with ankle clonus is found on the affected side. In hydrophobia, transverse myelitis, insular sclerosis, in tetanus and chorea we have an exaggeration of superficial and deep reflexes. Attention is directed to the chapters on Tubercular Meningitis and Epidemic Cerebrospinal Meningitis for clinical illustrations of the reflexes.

Diminution of Reflex Action.—The reflexes are lessened and sometimes absent in *melancholia*. Extreme pressure in the cranial cavity or in the spinal canal will reduce the reflex act.

Whenever a degeneration of muscles or nerves takes place, such as in diphtheria or other specific diseases, the reflexes will be lessened. The reflex is reduced or absent in acute anterior poliomyelitis.

Babinski Reflex.—In the newly born baby this reflex has frequently been noted under normal conditions. Instead of normal flexion of the toes, which is accomplished by irritation of the soles of the feet, we have in disease a *hyperextension of the toe*. This symptom is regarded as pathognomonic by some authors. In tuberculous meningitis, it is a valuable diagnostic aid.

Brudzinski's Neck Sign.—Technic. The head is forcibly flexed with the left hand while the child is lying flat on its back; with the right hand pressure is exerted on the chest to keep the child from being lifted. If the sign is positive, both legs will flex on the thighs and the thighs on the abdomen.

The identical collateral sign consists in flexing the leg on the thigh and the thigh on the abdomen, when the opposite lower member will assume the same position.

Reaction of Degeneration.—In health a faradic current of sufficient strength applied to the *nerve* produces a continuous contraction of the muscle; the galvanic, a momentary contraction when the current is made and broken only. When the nerve is diseased a stronger faradic or galvanic current is needed to produce contraction, until finally, when degeneration has taken place, no current which can be used produces any contraction. In health either current applied to the *muscle* produces contraction; the response both to the galvanic current and to the faradic is quick, being in both instances due to stimulation of the nerve-endings. With lesions of the nerves and consequent degeneration of the nerve-endings the faradic current produces no contraction, but since the galvanic current is capable also of stimulating the muscle fibers themselves, a contraction follows application, though more slowly than when the nerve-endings are healthy. After the degeneration has progressed to a certain stage, which is reached the earlier the more severe the case, this response of the muscle fibers to the galvanic current becomes more ready than in health. To this quantitative change is added a qualitative change. In health the weakest galvanic current which causes contraction of the muscle does so when the current is made with the negative pole on the muscle (kathode closure contraction, K. C. C.). When the nervous mechanism has degenerated a contraction may occur with as weak or with a weaker current when the

positive pole is on the muscle (anode closure contraction, A. C. C.) and contractions may occur also with the same current when it is broken (anode opening contraction, A. O. C., and kathode opening contraction, K. O. C.¹). To this altered qualitative and quantitative reaction of nerve and muscle to the electric currents the term "reaction of degeneration" is applied. It is not always as definitely marked as is above described. When the damage to the nerve is slight, the irritability of the nerve to both currents may be retained, and the only evidence of the existence of a reaction of degeneration is increased muscular irritability to the galvanic current, with some change also in the order of contraction to the poles (qualitative change). On the other hand, in very chronic changes the loss of irritability proceeds *pari passu* in nerve and muscle, and the reaction of degeneration is not to be observed.

With the regeneration of the nerve, recovery of function takes place, the rate of recovery depending mainly on the severity of the lesion. Voluntary power is first regained, then the galvanic reactions become normal, and lastly, the faradic.

Anesthesia, which is the eventful result of degeneration of a sensory nerve, may be preceded by a condition of hyperesthesia. The anesthesia is often incomplete, especially in the hands and face; in a mixed nerve a lesion, capable of producing paralysis of motion, may be accompanied by little loss of sensation. Trophic changes seem seldom to occur in children as an accompaniment of lesions of sensory nerves.

¹ The normal order is: K.C.C., A.C.C., A.O.C., K.O.C.

II.

CONVULSIONS.

CONVULSIONS occur most frequently during infancy. There are two types of convulsions met with: First, the clonic. Second, the tonic. Convulsions occur less frequently in the older child.

Etiology.—The brain grows more during the first year than in all later life. This rapidity of growth is in itself, according to some writers, an important predisposing cause of functional derangement.

Other exciting causes are: Diseases having a very high temperature, such as the acute contagious and infectious diseases; diseases accompanied by vascular stasis; toxic causes resulting from poisons; organic central lesions, and functional disturbances of the brain, such as epilepsy.

Of all the manifold predisposing causes of convulsions in young children, the most important one is the natural instability of the nervous centers, characteristic of early life, and associated with the non-development of voluntary centers of the cortex; hence it is that age is a most important factor in the etiology of convulsions; and under 2 years is recognized as by far the most susceptible period. Statistics show that over 60 per cent. of deaths from convulsions, up to 20 years, occur in infants under 1 year of age. Convulsions are not only more common in infancy, but much more fatal than later in life, and for reasons that are very apparent. Males seem to be more susceptible than females; statistics seem to justify this conclusion, but it has been suggested that inasmuch as more males than females are born each year, the larger number of deaths in males may thus be reconciled, as females are more delicately organized, while the exciting causes are probably about equal.

The Peripheral Causes.—The peripheral causes are rachitis; gastric disturbances, such as acute catarrhal gastritis; intestinal worms; foreign bodies in the ear and nose, causing reflex convulsions; scalds and burns, and mental disturbances, such as fright. Lewis says: Convulsions are in all probability due to an *exaltation* of the *lower* nerve-centers; or more frequently, to a suspension of the inhibitory power of the *higher* cerebral centers

—or both of these conditions may exist at the same time—and further, it remains to be said that we are still very much in the dark as to the immediate processes producing convulsions.

At birth, the lower centers only are developed, and control is limited until the higher centers become competent to exert *inhibition*; hence in the earlier months of life convulsions are common, and less so after two years.

Hypertonic infants are prone to convulsions. Such infants are usually rachitic, and suffer with laryngeal spasm in addition to tetany.

Improper feeding may be looked upon as the most frequent cause of convulsions. A child that is improperly fed and suffers with a subacute or chronic form of dyspepsia, suffers with a deficient structure. Toxemic conditions resulting from bacterial infection are a most frequent cause of convulsion.

Pathology.—The development of the nervous system is not complete at birth. Very little light is shed upon convulsions by post-mortem findings. Usually after death from convulsions there is an effusion or hemorrhage found or there is a venous stasis in the brain. When death occurs from laryngospasm it results from suffocation. The condition of the brain in the beginning of an attack of convulsion is one of anemia. This is shortly followed by a nervous hyperemia. The brain and meninges are usually found intensely congested and engorged. Sometimes punctate hemorrhages can be found. The lungs are also deeply congested and the right heart is generally distended with dark clots (Holt).

Symptoms.—There is usually a loss of consciousness. The onset is sudden. A child may appear perfectly well up to the time of its convulsion and then suddenly the arms and legs become stiff, the eyes fixed and staring or rolled up under the lids. Respiration is usually arrested, the head is retracted; finally the whole body becomes rigid.

The above named symptoms belong to the *tonic stage*. It is usually followed by *clonic* convulsions more or less severe and prolonged, affecting the upper and lower limbs, the face and eyes.

Sometimes the tonic and clonic convulsions are few and the whole spasm may last less than a minute. Some children show no sign of illness after the attack is over, and appear perfectly normal. The attack may recur at short intervals. The child may then become comatose and die before proper treatment can

be instituted. It is important to examine the urine. The possibility of a nephritis should not be overlooked.

Diagnosis.—It is usually very simple to differentiate from epilepsy, which is most frequent after the third year.

Convulsions usually are the first symptoms of the invasion of an acute disease. Scarlet fever, pneumonia, malaria, gastritis, and meningitis may be ushered in with convulsions. Measles is sometimes preceded by convulsions. Pertussis in which there is cerebral congestion may cause convulsions. Bronchitis, membranous laryngitis, and laryngismus stridulus are sometimes preceded by convulsions. Do not suspect teething or worms as a cause of convulsions until all other causes have been eliminated.

Treatment.—Our first plan of treatment is to control the convulsions. The child should not be moved about. A few drops of ether or chloroform should be cautiously used until the spasm ceases. Do not give medicine nor food during a spasm. After the child is quiet a hot tub bath into which mustard is added should be ordered. With the feet very warm the head should be kept cool.

After the spasm is controlled an injection of one pint soap water, into the rectum or colon, should be given. Several teaspoonfuls of castor oil should be given and if refused, calomel in $\frac{1}{4}$ -grain doses, four doses in all, in intervals of ten minutes will cleanse the intestine.

When convulsions recur, then chloroform inhalations should be continued. If convulsions continue for several hours and only temporary relief is noted after the inhalations of chloroform then a lumbar puncture (see *Technic*, page 994) is almost specific in relieving intracranial pressure. It usually promotes sleep. No less than 25 to 30 cubic centimeters should be withdrawn although where very high pressure exists 75 to 100 cubic centimeters can easily be removed. If the fontanel bulges and the superficial veins of the scalp are distended, in a case of recurring convulsions it may be necessary to aspirate one or both lateral ventricles. Aspiration of the ventricles should always be performed in case of a dry tap during lumbar puncture.

A tub bath or cool pack, to reduce the temperature, may be ordered every hour if convulsions continue.

Any child having convulsions should have its food diluted so that it receives one-half the strength of its former feeding. If whole milk was given, then 4 ounces of milk and 4 ounces of

water should be ordered. When milk disagrees; broth, vegetable soup or whey may be given. Water should be given freely to stimulate diuresis.

A child, 4 years old, was suddenly seized with convulsions, clonic and tonic spasms involving the face, arms, and legs. From the history, the child had overloaded its stomach, was very feverish, and thirsty. A mustard footbath was ordered and a rectal injection of:

℞ Sodium bromide 10 grains.
Chloral hydrate 5 grains.

was injected into the rectum with two tablespoonfuls of thin starch water.

One or two inhalations of chloroform were given to relieve the convulsions.

The diagnosis of acute catarrhal gastritis was made and the convulsions attributed to a general toxemia. When the convulsions ceased the stomach was washed with two quarts of warm water to which two tablespoonfuls of salt had been added. Food was discontinued and an interval dose of:—

℞ Sodium bromide 5 grains.
Chloral hydrate 2 grains.

was given every hour until the child was in a deep sleep. Twelve hours after the convulsions first began, thin soup and broths were ordered. The child was well in two days.

To control convulsions:—

℞ Sodii bromidi 5 grains.
Chloral hydrate 5 grains.
Starch water 1 tablespoonful.

Mix thoroughly and inject, if possible, into the colon, through a small rubber catheter. Repeat every hour until convulsions cease.

HEADACHES.

Various forms of headache are encountered in children. As a rule very little reliance can be placed on headaches complained of by young children. There are four kinds of headaches which are most frequently seen in older children: Reflex headache, headache due to general systemic cause, headache of local origin such as eyestrain from astigmatism and headache due to brain lesions.

In chlorotic girls or in anemic children headache is a common symptom. During menstrual disorders girls will usually complain of headaches.

There are hundreds of cases of headache due to eyestrain in school children. These children complain of headache during and after school hours. The headache disappears during the night and the children never complain of headache in the morning. These cases should be referred to the oculist. As a rule astigmatism is found.

Headache due to autointoxication resulting from impacted feces is frequently encountered. Rheumatic children and children of gouty parents frequently complain of headaches. Such headaches are frequently found in lithemia.

Children frequently complain of headache which is due to intra-nasal neoplasms. At other times such local causes as supra-orbital neuralgia, due to neuralgia of the fifth cranial nerve, will cause an intense headache. In persistent headache it is advisable to have the ears carefully examined by an aurist. The frequency of middle-ear disease should be borne in mind.

In older children headache of a persistent character, associated with vomiting, should always be looked upon as suspicious of cerebral trouble. A case of this kind is reported by me in the chapter on Cerebrospinal Meningitis. In older children suffering with persistent headache it is advisable to examine the fundus of the eye to see if a choked disc is present. In one of my cases a tumor of the cerebellum was diagnosed in this manner.

MIGRAINE (SICK HEADACHE, HEMICRANIA).

This is a headache confined to one side of the head, associated with dizziness and generally vomiting.

Causes.—Overworked school children of a nervous type usually have these attacks. Children suffering with dyspeptic attacks are more frequently the victims of migraine. An indoor life in a crowded apartment will cause this condition. Eyestrain is frequently the cause.

Treatment.—The bowels must be regulated. Constipation if present should be relieved. If headache is not relieved by laxatives and a corrective diet, then an open air life and gymnastics should be ordered. The eyes, if at fault, should be treated, and if astigmatism is present the same should be corrected.

When children complain of recurring headaches, the condition should be considered seriously until the cause of the same is found and eliminated.

Worms and impacted feces, in addition to toxic conditions cause more than 50 per cent. of all headaches noted in children. Temporary relief can be given by ordering 5-grain doses of bromide of sodium every three hours. Hot baths will also relieve a headache. Meat, eggs and large quantities of carbohydrate, especially cake should be prohibited in children suffering with recurring headache.

Premenstrual headaches are usually cyclic in character, and recur every four weeks. They last one or two days until the flow appears. These headaches are best relieved by hot baths to which mustard is added. Phenacetine in 5-grain doses, with caffeine $\frac{1}{2}$ grain gives quick relief. Pyramidon in 5-grain doses is another excellent drug. More than two doses in interval of one hour is rarely necessary.

The diet should be regulated and a laxative dose 10 to 20 grains of phosphate of soda should be given. The value of bromide of soda in Seltzer water, with or without caffeine, should be remembered.

SPASMUS NUTANS.

This condition is frequently associated with rickets. It is characterized by an involuntary and uncontrollable head shake.

Etiology.—It may be associated with or follow traumatism. Fright and other psychical disturbances may cause this condition. Heredity plays an important part in its development. It is usually found associated with rickets. In a case of mine presented to the Section on Pediatrics of the New York Academy of Medicine, spasmus nutans was associated with sporadic cretinism.

Symptoms.—In some cases we see a continuous nodding, in other cases the motion is rotary. In rare cases both motions, nodding and rotary, may co-exist. Nystagmus, which is a movement of the eyes, rhythmical and oscillatory, either vertical or horizontal, may also be present.

Prognosis.—This depends on the cause of the same. As a rule the prognosis is good.

Treatment.—If rickets is the cause give the child anti-rachitic treatment. If it is associated with cretinism, as in the case reported by me, then give thyroid treatment. A change of air and general restorative treatment are also beneficial in these cases.

Electricity is not indicated and should not be used. Massage may be tried.

SPEECH DEFECTS.

Stuttering.—This is a condition due to a series of contractions and spasms of the muscles concerned in speech. According to Scripture, the essential pathological fact is a special state of mind.

Pseudostuttering.—This symptom is found in hysteria, cerebral spasticity, athetotic conditions, aphasia, and some forms of amyotrophic lateral sclerosis.

Lisping.—There are various types of lisping. Organic lisping is caused by a defect in the teeth, tongue, palate or ears. We may have negligent lisping due to a faulty perception and execution of sounds. This condition may be found in normal children as well as in those of deficient mentality. The necessity for proper medical supervision in the treatment of this class of cases is forcibly expressed by Scripture,¹ who maintains that the speech organs must be examined by a physician familiar with the anatomy of the nose, throat, and larynx. In addition thereto, neurological training is necessary for a proper understanding of stuttering. Such cases should be sent to a proper clinic, where speech defectives can be classified according to their individual defects.

CHOREA (ST. VITUS' DANCE).

This is a neurosis characterized by irregular, involuntary movements of the muscles. It usually affects the muscles of the extremities, face, and tongue. It is most likely caused by a specific micro-organism not yet identified.

Etiology.—As a rule, this disease is most prevalent between the ages of 7 and 14 years. Chorea generally occurs in bright, precocious children. It is seen more than twice as frequently in girls as in boys, and the disproportion becomes even greater after puberty. It is extremely rare in dark-skinned races. Chorea rarely becomes chronic, although it recurs in about one-third of the cases. It is more likely to recur in girls. Fright and shock frequently aggravate this disease.

Mackenzie reports 439 cases. The largest number of attacks occurred in the thirteenth year.

¹ The Care of Speech Defectives, Medical Record, Feb. 22, 1913.

| | |
|-------------------------------------|--------------|
| 34 per cent. occurred between | 5-10 years. |
| 43 per cent. occurred between | 10-15 years. |
| 16 per cent. occurred between | 15-20 years. |

Sachs reported a case seen in a child under 1 year of age, and several cases seen in children between 2 and 3 years of age. The reported congenital cases are usually mistaken instances of organic cerebral disease.

Sinkler found, that of 328 cases 232 were females and 96 males. Gowers studied the statistics of 1000 cases and found 365 in boys and 635 in girls.

Lewis, of Philadelphia, studied 717 cases and found that the largest number occurred in March, the next largest number in May, and that the curve corresponds with the rheumatism curve.

My own experience is that we have an equal number of cases occurring in the spring and fall, *depending on the amount of study and the sedentary life induced by too much school.*

In a large children's service among the poor tenement population, out of 100 cases of chorea examined by me, 80 cases occurred in females; 20 cases in males.

All of my cases were school children who were apparently well when their chorea commenced.

Overstudy in School.—Sturges, in London, has given considerable attention to the question of overstudy, and he believes that it is an important etiological factor in the causation of this condition. Overstudy (apparent) may mean only inability to study due to lack of mental concentration.

Chorea frequently follows the infectious diseases. It is seen after scarlet and typhoid fever. I have seen chorea of a very severe type follow a fright and also after bad dreams, in school girls. Reflex causes, such as phimosis, pin worms, and delayed menstruation, are cited by some authors.

When neuroses or psychoses in parents exist then there is a predisposing cause for chorea in the children.

Vaginal discharges will frequently excoriate the vulva. This produces itching, and the scratching therefrom frequently induces masturbation. This is a frequent forerunner of chorea.

Reflex conditions, such as adenoids and polypoids, have been reported from time to time.

The reflex causes are overestimated. Adenoids are more likely to induce tics rather than chorea.

TABLE No. 67.—THE ASSOCIATION OF CHOREA WITH RHEUMATISM.

| | | |
|----------------------------|-----------|------------------------------|
| Steiner reports | 252 cases | 4 suffered with rheumatism. |
| Sachs reports | 70 cases | 8 suffered with rheumatism. |
| Sinkler reports | 279 cases | 37 suffered with rheumatism. |
| Crandall and Holt report.. | 146 cases | 63 suffered with rheumatism. |
| Fischer reports | 100 cases | 25 suffered with rheumatism. |

Twenty-five Per Cent. of my Cases had Undoubted Rheumatism.

—By rheumatism I include cases that complained of pains in or around the joints. At times they were described as “growing pains” by the parent.

Frequency of Endocarditis.—Valvular lesions have been seen by me in chorea without any antecedent joint lesions. The ease with which rheumatism is overlooked in children makes the clinical history as given by parents doubtful. It is, therefore, possible that there are many more cases of rheumatism associated with chorea than are reported.

Association with Tonsillitis.—Of the 100 cases of chorea previously reported by me, more than 80 cases had enlarged tonsils. It seems quite probable that *the tonsil is the point of entrance* of the pathogenic bacteria which cause chorea, and most probably rheumatism and endocarditis.

Pathology.—There are no distinct pathological lesions which can be attributed to chorea. Sachs says that the pathology of chorea is still a great mystery. Not that autopsies are wanting, but there have been so many different post-mortem findings described that each writer may be said to have his own views concerning the pathology of chorea.

Symptoms.—Chorea usually begins with prodromal symptoms. The children as a rule are very irritable, depressed, and cannot hold their arms or legs quiet. They complain of pain in various parts of the body. The main symptoms which attract the attention of parents or nurses are motor disturbances. These consist of involuntary twitchings affecting various muscles or groups of muscles. The muscles of the hands, the legs, the facial muscles, and the tongue show this choreic twitching. At times there is a decided interference with speech. A point worth noting is that the child cannot control these movements voluntarily. The greater the effort to control these movements, the more the twitching will be noticed. Sachs emphasized the fact that in doubtful cases *choreic movements of the tongue* will often prove the nature of the disease. This I have frequently been

able to verify when it was a question of habit spasm or true chorea. There is a certain awkwardness which is typical in a choreic patient. This can be noticed when the child attempts to do anything. Choreic movements *do not occur* as a rule in the night when the child sleeps. The pupils are frequently dilated. Children are sometimes punished at school for restlessness which is the beginning of true chorea, and it is only later in the disease that the true character of the same is detected. In some cases but one-half of the body (hemi-chorea) is affected. In other cases choreic movements are stronger in the upper than in the lower extremities. Children seem to suffer muscular weakness and there is loss of muscular power. A peculiarity of chorea is that in spite of the constant muscular twitching there is little exhaustion. The reflexes (patellar) are exaggerated.

Condition of the Heart.—Very frequently a systolic murmur has been heard during the course of chorea. This systolic murmur persists for months after the last symptoms of chorea disappear. Pains in the large joints are frequently described. I have invariably noted a slight rise in the temperature (101° F.) when the joint pains or endocarditis existed. When chorea appeared without evidences of cardiac or arthritic complications the temperature *invariably remains normal*.

Fannie S., 11 years old, was a very anemic girl. She had been sick for two months with tonsillitis and influenza. She was compelled to stay away from school, and in order to catch up with her class, studied very hard, especially at night, until she passed her examinations.

History Given by Mother.—The child complained of headache, her appetite was poor, the bowels constipated. She was restless by day and did not sleep well at night. She had nervous twitchings of the arms and legs. The fingers were never still. She did not appear contented at anything. Her eyes were examined by an oculist, who prescribed eyeglasses. He said the child had eyestrain. The mother believed there was a slight benefit after wearing the glasses.

When the child was brought to me, there were distinct evidences of chorea, with twitching of the face, the tongue, the hands and the legs. Four drops of Fowler's solution was prescribed, three times a day, and gradually increased until 7 drops were given three times a day. All school and study was stopped. Cold sponging and a cold shower was ordered every morning and evening. Cereals, vegetables, milk, and fruit were given. All meat was stopped. An active outdoor life and all quiet games and sports were recommended. Under this treatment the symptoms gradually subsided and the child recovered. One year later the

same symptoms returned, and it was found that the cause of the relapse was overstudy.

The child was sent to the country. School was discontinued for one year. The chorea disappeared without medication.

Course.—The usual course of this disease is from six to ten weeks, although it may extend to four months. I have seen cases in which there was a severe attack in the spring, which seemed to disappear entirely during the summer, and suddenly reappear with greater intensity in the fall.

Prognosis.—The outcome of a case of chorea is usually good, especially so if we are dealing with intelligent mothers and nurses. The prognosis is bad if endocarditis or other organic lesions are associated.

Treatment.—Regarding the use of eyeglasses, many oculists believe that chorea is induced by defective vision and that the irritation resulting from eyestrain is the main reason for the chorea. Many cases have been seen by me after wearing glasses for many months without any apparent benefit. It does not seem plausible to believe that eyeglasses alone can cure chorea.

Hydrotherapy.—Lukewarm tub bathing is very soothing to the nervous system. These baths may be given in the morning and be followed by cold showers. In some cases of chorea, restlessness is followed by insomnia. Such cases do very well by giving very warm tub baths at night.

Autoserum Therapy.—A. L. Goodman advocates the use of intraspinal injections for the treatment of chorea. His method consists in drawing off 50 cubic centimeters of the patient's blood from the median basilic vein. This blood is centrifuged for about one and one-half hours or until all the blood corpuscles have separated and a clear serum remains. This serum is injected by means of a Luer syringe into the spinal canal. It is unnecessary to inactivate the serum. A lumbar puncture is made in the usual manner between the fourth and fifth vertebræ and 15 or 20 cubic centimeters of the spinal fluid is withdrawn. Through the same needle left *in situ* the blood serum is injected in amount equal to, or somewhat less than, the fluid withdrawn. The serum is not warmed. It is injected at room temperature. An anesthetic is seldom used. The injection must be given slowly so that cerebral shock is avoided. To one having performed this operation many times there comes a feeling of resistance when 15 or 20 cubic centimeters have been injected.

When this feeling of resistance is encountered we should withdraw the needle from the spinal canal. If too much serum is injected intracranial pressure will result and vomiting, rigidity, or even collapse with an irregular or intermittent pulse may follow. The patient should be left in a recumbent position for at least several hours after this injection. Liquid food, such as sour milk, broth and weak tea, should be given. Walking should be prohibited at least one day after this injection. Attention to the bowels is very important. If no movement has taken place then one pint of soap water should be injected. The action of the kidneys should be noted and the patient reminded regarding urination. Goodman states that one injection is sufficient to control choreic movements and rarely has he resorted to a second injection.

Literature records many excellent results from this form of treatment. Alan Brown in Toronto¹ reports a series of 25 cases in which 77 per cent. were cured, 19 per cent. improved, and 1 per cent. unimproved.

Five of these cases reported were very severe, seventeen were mild.

Goodman advises against giving any medication for at least four or five days before giving the injection. It seems that there must be some chemical action in the blood plasma which causes a very potent action of the drugs when injected into the spinal canal. Goodman tried to see if we could use the serum of one case and inject that into others suffering from the same disease. The results were unsuccessful. It is absolutely necessary to use the serum of the same patient in order to get results. With the auto serum treatment the result is manifested within two or three days. Sometimes the patient needs a second injection, and sometimes a third. Usually one injection is sufficient.

A child should be removed from school and thus guarded against all psychical disturbances. Cold sponging of the entire body and cold spinal douches have been found very beneficial.

Antipyrin and bromide of sodium may be used in some cases. When chorea is associated with rheumatism, the salicylate of soda in 3- to 5- grain doses, or salipyrin in the same quantity, may be given three or four times a day. Some authors advise against the use of chloral hydrate; my experience with 2-grain

¹ ALAN BROWN: Canadian Medical Week, May 27, 1918. Published by MacMillan Co. of Canada.

doses of chloral hydrate given morning and evening has been very good. If choreic twitching does not improve after several weeks of persistent treatment, then a cold pack may be tried. A sheet wrung out in cold water at a temperature of 60° F. should be wrapped around the child for one hour every morning and evening. Not only have I seen a soothing effect on the nervous system from these packs, but they frequently promote sleep.

The diet should be light and very nutritious. All cereals should be given (see diet list for a child from 3 to 10 years old, page 96). Meat should be avoided, although meat soups and lamb or chicken may be permitted. Fresh air and quiet out-of-door exercise, games, and sports are necessary adjuncts in the treatment of this disease.

TORTICOLLIS (WRY-NECK).

This condition is caused by the spasm of one sterno-cleido-mastoid muscle. Sometimes there may be a spasm of the posterior cervical muscle, including the trapezius.

Etiology.—Congenital torticollis is a rare condition. When it is present it is due, according to Whitman, to a constrained condition in utero.

More common than the congenital condition is the acquired torticollis. The following is Whitman's classification:—

1. The acute.
2. The chronic.

Acute torticollis (traumatic torticollis) may be divided into three classes:—

- (a) Stiff neck, due to cold or to rheumatism.
- (b) Distortion caused by strain or other injuries.
- (c) Distortion due to irritation of the peripheral nerves as following sore throat, or secondary, to enlarged or suppurating cervical glands (reflex torticollis).

The ordinary stiff-neck is of but slight importance. The traumatic wry-neck is efficiently treated by support. Reflex torticollis is by far the most important of the forms of acute torticollis, and it is the usual cause of persistent distortion.

Chronic Torticollis.—From the clinical standpoint, both the congenital and the reflex torticollis, after the acute stage has passed, are forms of chronic torticollis; the class includes also those forms in which the onset has not been accompanied by pain.

Rachitic torticollis, usually a postural or compensatory distortion caused by deformity of the spine.

Ocular torticollis, caused by defective eyesight.

Psychic torticollis, a functional or hysterical deformity.

Spasmodic torticollis, a convulsive *tic*—rather a form of nervous disease than a simple deformity.

Any irritation of the spinal accessory nerve or its branches may bring on this spasm. Whitman¹ gives the following statistics of 264 cases extending over nineteen years, torticollis from Pott's disease not being included: Males, 109; females, 155; congenital, 32; under 2 years, 33; from 2 to 10 years, 153; over 10 years, 46; acute (less than two months' duration), 77; chronic, 60, of which number 22 had lasted over two years or longer.

Holt believes that an enlarged cervical lymph gland irritating the spinal accessory nerve can bring on this spasm. He also mentions malaria as a cause. I have observed similar conditions. In several of my cases the spasm was present when malarial infection existed, and subsided when quinine was given. Torticollis has also been observed by me after the sudden chilling of the body.

Symptoms.—The head is drawn to the affected side. If the trapezius is affected there is slight rotation of the head, but if the trapezius is not affected the head is rotated toward the healthy side.

A child 6 years old was taken on an open car. She was in a healthy condition, appetite good, bowels regular, apparently nothing wrong. She complained of being cold and on the following day had a wry-neck. Salicylate of soda, in 5-grain doses three times a day, and massage of the sterno-cleido-mastoid with spirits of camphor seemed to relieve the pain. The best result was obtained by the use of a mild faradic current. The condition lasted about nine days. The child was discharged cured.

The above case illustrates the form commonly described as rheumatism or "rheumatic torticollis."

Treatment—*Medicinal and Local*: Early treatment means success. Delayed treatment means disappointment in most instances. When specific causes exist, such as malaria or rheumatism, they should be treated by specific remedies. In every case warmth, as flaxseed poulticing and massage, will do good. Sometimes the application of iodine over the affected muscles will do good.

¹ Report for Hospital of Ruptured and Crippled, New York.

Surgical Treatment.—Lorenz describes the fine results attained by subcutaneous intentional rupture of the sterno-cleido-mastoid muscle to cure obstinate wry-neck in children. The subject lies with a hard cushion under the shoulders, the head and neck unsupported. The shoulder is drawn down at the same time and it is thus possible to tear the muscle by gradual dehiscence, followed by over-correction. Parents accept this operation much more readily than when the knife is used, and the dehiscent fibers heal under the intact skin with little if any cicatricial formation. The cure has been ideal and permanent in all his cases.

HYSTERIA.

It is an important matter to recognize this condition when met with in children. It is rarely seen in children under 7 years of age, although cases are on record of distinct hysteria having been met with in infancy. In my experience children rarely simulate disease. I have seen children imitate an invalid mother and complain of imaginary pains and aches at the same time and in the same portions of the body as the mother. Very neurotic children, susceptible children, and children having bad habits, such as masturbation, are more prone to develop hysteria. Charcot maintained that hysterical persons are hysterical because they are mentally degenerate.

Pathology.—Hysteria is not a fatal disease, hence we have no specific pathological lesions. The theory concerning the mobility of the neuron, while very interesting and scientific, does not explain the hysterical paroxysms. Hysteria is not a psychosis as is generally supposed. There are no known demonstrable lesions. While in some cases the whole brain seems disturbed and involved, in other cases but one-half of the brain is involved.

Symptoms and Diagnosis.—Paralyses occur in hysteria which simulate those due to central nervous disease. As a rule, however, they disappear. The hysterical paroxysm usually follows close upon an aura. It sometimes comes on suddenly, although it may be preceded by a spell of laughing or crying. Children old enough to complain describe a "lump in the throat" similar to the "globus hystericus" which occurs in the adult.

Some symptoms closely resemble epilepsy. Headache is complained of at times. The screaming and shouting gradually cease as the attack subsides. The patient sinks down or falls

prone upon the back, with the limbs extended and rigid, but with the fingers and toes flexed; the eyes are usually rolled slowly from right to left, or crossed; the jaws are firmly closed; the breathing becomes slow and labored, and later hurried, the face flushed or bluish, the neck turgid; the cardiac action becomes more rapid and forcible, and consciousness is almost, but never entirely, lost. Sensation is much obtunded, and abolished in some portions of the body. Soon clonic movements succeed—a tremor affecting the muscles of the trunk, extremities, and face. This alternates with electric-like startings, during which the patient may fling himself furiously about, or actually out of bed. Presently this stage ends with sighs, and is followed by a short sleep. Some authors describe a series of dramatic movements. There may be opisthotonos. The child may have a bowing of the lumbar curve so that it rests upon its head and heels. There may be a series of attacks recurring so that as many as two hundred paroxysms have been recorded by Sachs. I have attended a severe form of hysteria with more than ten paroxysms during one hour. Tender areas over the ovaries and spine in girls, and the testicles of boys, are present. Some authors claim that pressure over these areas will sometimes invite an attack of hysteria; on the other hand pressure over these same sensitive areas will sometimes stop an attack.

Vomiting when it does occur is a very serious symptom. We do not have the same forms of tremor as are seen in adults.

Borborismus (rumbling gas in the intestines) is occasionally heard in this condition.

Epidemics of hysteria are frequently described. Taylor describes one occurring in a church home at Philadelphia.

Prognosis and Course.—The duration of the disease depends on the surroundings of the child. Mild hysteria will sometimes disappear after a change of scene and air of several weeks. In some instances a case may last years or through the child's whole life.

It is always well to remember that hysteria is difficult to cure. If a child is sensitive and subjected to impressions from a neurotic family, then a cure will be difficult. The outcome of any case of hysteria depends on the character of the surroundings and on the mental influences with which the child is brought in contact, rather than on drug treatment.

CASE I.—A girl 9 years old was brought to me for the relief of headache. She complained of a continual headache night and day. The appetite was poor, the bowels moved sluggishly. She was restless during the day, and had insomnia at night. She complained of bad dreams. She looked haggard and worn, as though she were convalescing from some severe illness. She was anemic and had cold extremities. Heart, lungs, liver, and spleen were normal. She was a very restless child with marked hyperesthesia. The patellar reflexes were exaggerated.

Subjective Symptoms.—The child complained of pain in every part of her body. On being asked, "Does your side hurt?" she answered, "Yes, my pains are in the side and in the back, just like my mother's." I referred the child to an oculist for an opinion as to the eyes, and his answer was: nothing abnormal, no astigmatism. The child cried on the slightest provocation, and was also almost convulsed with laughter for trivial matters. The diagnosis was hysteria. The child had a headache, or a backache, and always complained of some ache. It was quite evident that the child's hysteria was due to *suggestion by the mother, who was an invalid.*

The treatment consisted in removing the child to an aunt in a neighboring city, amid healthy surroundings. Iron was ordered to build up the system, and bromide of soda in 10-grain doses was given every night for one week, later every other night. Electricity, the baths, and massage were used with great success. In three months the child had rosy cheeks, slept well, was cheerful, and did not complain of any pain. It was strange, however, that when taken back to her mother, she immediately relapsed into her former habit of complaining. We determined to remove her permanently, and she remained well for over a year when I last heard of her.

CASE II.—*General Hysteria and Nervous Vomiting.*—A girl 12 years old was brought to my children's clinic for the relief of vomiting. She was very nervous and complained of pains all over her body. She complained also of pains in her stomach before and after eating. Her mental condition was poor, the hands and feet were cold. She complained of epigastric pains for the last six years. From the mother I learned that the child was frightened by a dog and since that time she has been very sensitive to the slightest impression. The gastric contents were siphoned off after a test meal and a hyperchlorhydria was found. The urine contained acetone.

The treatment of this case was most successful when large doses of bromides were given.

Treatment.—*Hygienic Treatment:* If the child is old enough, a walk should be ordered several times a day. The bicycle and horseback are valuable adjuncts. The sponge bath or the tub-bath aided by a cold shower or spray chiefly over the spine, head, and neck, have very tonic properties.

Hydrotherapy properly used is one of the most valuable aids in promoting a cure.

Notwithstanding the shock of a cold spray, the same should be ordered winter or summer.

After the bath the body should be rubbed vigorously, or better yet, massage should be given. I have always found a very soothing effect on the nervous system by giving gentle but thorough massage. Another remedial agent which must be used regularly is electricity. This should be used daily by means of a mild faradic current, one electrode to be applied over the spine, the other over the phrenic nerve. If no benefit is noticed after this treatment is tried, then static electricity can be used.

Study the cause or causes, and remove them if possible. Change the surroundings of the child by removing to a cheerful but quiet home. If the case occurs in the country, bring the child to the city. In any event the main point should be to change the entire scene and surroundings. If a child is in an institution, remove it from the same if it is at all possible. The person in charge of the child should be either a very intelligent mother having a positive influence over the child, or a mild-mannered trained nurse. All orders of the physician should be strictly obeyed without having the child feel that vigorous treatment is being used. This psychosis requires educational treatment as has just been described.

MULTIPLE NEURITIS (POLYNEURITIS).

This is frequently termed a peripheral neuritis, as it is an affection of the terminal branches of the nerves. It usually affects all the nerves of the limbs on both sides of the body. Starr gives the following classification:—

1. Toxic cases due to the action of a poison derived from within the body, as an accompaniment or sequel of influenza, gas, bisulphide of carbon, the coal-tar products, especially sulphonal and trional; and nitrobenzol; also, arsenic, lead, mercury, copper, phosphorus, and silver.

2. Infectious cases due to some agent acquired or developed within the body, as an accompaniment or sequel of influenza, diphtheria, gripe, typhoid, typhus, malaria, scarlet fever, measles, whooping-cough, smallpox, erysipelas, and septicemic conditions, including gonorrhea and puerperal fever, epidemic forms of beriberi or kakke, and leprous neuritis.

3. Cases due to general diseased states of the body whose origin is undetermined, such as rheumatism, gout, diabetes, anemia, marasmus, general malnutrition consequent upon tuberculosis, syphilis and senility, carcinoma, and local malnutrition produced by arterial sclerosis.

4. Cases due to exposure to cold and developing spontaneously without known cause.

The most common type of multiple neuritis met with in children is either the diphtheritic type or that resulting from poisons in the blood, such as the prolonged administration of Fowler's solution (arsenical poisoning).

Symptoms and Diagnosis.—Multiple neuritis may come on suddenly or the onset may be gradual. The special senses are rarely involved in this condition. The motor symptoms are as marked as the sensory. Paralysis comes on first as a muscle weakness, and gradually increases until distinct paralysis is present. The extensor muscles of the wrist, hands, and feet give the wrist-drop and the foot-drop. Very rarely the muscles of all four extremities in addition to the muscles of the trunk and neck are involved. The knee-jerk usually disappears early when neuritis follows diphtheria. The paralyzed muscles are relaxed, flabby, and atrophied. An important symptom is that faradic excitability is absent, and that the muscles respond to a galvanic current only. This symptom is identical with that found in acute anterior poliomyelitis. The reaction of degeneration is present.

There is no incontinence of urine or stool. Atrophy rarely follows. The condition is similar to that seen in poliomyelitis. There may be other vasomotor disturbances such as unilateral flushing of the skin, or small areas may show a high glossy flush. This last symptom was very prominent in one of my cases. An edema of the affected parts is described by some authors. As a rule the areas affected are very sensitive, so that we have distinct hyperesthesia. In other cases the opposite condition prevails and there are areas of local anesthesia. The disease may be ushered in by a fever. The temperature may rise to 103° or 104° F., and remain several days. The pulse-rate is correspondingly increased and may reach 140 or 160.

Gastric disturbances associated with diarrhea may be present. The spleen is frequently enlarged, and an examination of the

blood will show a distinct leucocytosis, the latter condition when neuritis is a sequela to an infectious disease.

Course and Prognosis.—The course is a long and tedious one. As a rule these cases last years. When the muscles are strengthened by massage and electricity, improvement will be noted. These cases rarely recover, although great improvement can be attained by systemic treatment.

Treatment.—Many cases improve when the limbs are placed in plaster-of-Paris, and enforced rest is given. Other cases do better when mild, passive movements, light gymnastics and gentle massage are given. If the circulation is poor alternating with a cold tub followed by a hot tub, half a dozen times in each, is a good vasomotor tonor.

General systemic restoratives such as iron, arsenic, and the iodides should be remembered. Food should be given frequently. Careful attention should be given to the intestinal tract as metabolism is one of the most important factors in restoring tissues. Strychnine by mouth or hypodermically is one of the most important drugs in this treatment.

PAVOR NOCTURNUS (NIGHT TERRORS).

Children apparently healthy will sometimes awaken from a sound sleep and shriek or scream and appear to be frightened.

Etiology.—In this condition children usually show some disturbance of the stomach or bowels which may have been the exciting cause of the night terror. Reflex irritability is frequently caused by intestinal worms and by late eating. Such children usually possess a neuropathic constitution by inheritance. Henoch states that some children may have hallucinations during the day.

Symptoms.—Some children awaken frightened and screaming, while others will grasp anything within reach in a bewildered manner. They frequently imagine that animals are in the room. The effect of too rigid discipline will sometimes show itself by bad dreams at night, and in a distinct hysterical symptom, such as fright and terror. These attacks occur but once during the night, and after reassuring the child that there is no danger, it will again fall asleep.

Course and Prognosis.—If these night terrors are associated with mild nervous attacks during the day, or if they partake of

the nature of epileptic attacks, then a cautious prognosis should be given. The inclination to serious brain or nervous trouble must always be remembered; therefore, no opinion should be ventured until a case has been properly observed.

The immediate treatment consists in reassuring the child and soothing it off to sleep. If, however, the hysteria continues then a warm tub bath should be given. An older child should also receive 10 grains of bromide of sodium. A child under five years of age, 5 grains of bromide of sodium. This will usually quiet the child and promote sleep. The following day santalin 1 or 2 grains with calomel $\frac{1}{4}$ grain should be given to cleanse the intestinal tract of oxyuris.

Meat should not be permitted at night. Late eating should be stopped. Night study should be discontinued. If a rigorous discipline has been the origin of this disturbance then the method of supervision should be relaxed. Active peristalsis should be stimulated by giving several teaspoonful doses of milk of magnesia or aromatic cascara for two days following such attacks. If any specific cause for the same exists, be it rigid discipline at school or elsewhere, then the child should be removed from its surroundings.

MASTURBATION (ONANISM).

This habit is very frequently seen in children. I have seen it in girls as well as in boys.

Causes.—Any irritation of the genital tract that will cause itching may be the origin of masturbation. In boys an elongated prepuce, or friction from phimosis, may give rise to this condition. Very acid urine may cause excoriation and thus invite this bad habit. Excoriations at or near the external meatus may be the starting point. We see this condition quite frequently in girls when preputial adhesions due to smegma or dirt cause an irritation of the clitoris or when pin worms wander from the anus to the vagina. Worms frequently set up an irritation resulting in masturbation. A diaper if too tightly pinned can set up an irritation, especially in female children.

Symptoms.—Children usually place their hands on the genitals and masturbate. They sometimes rub their thighs together until exhausted. During this friction their face will be flushed and they appear irritable.

Such children suffer with profound anemia as the result of this habit; and from loss of sleep. Older children, especially boys, will masturbate chiefly at bedtime. They are peevish, irritable, and very sensitive.

An infant about nine months old was seen by me in consultation. The mother complained that the child continually rubbed its thighs. The face was flushed during the rubbing; later the child would fall asleep as though from exhaustion. This condition seemed to occur chiefly when the child was placed on the bed or held on the lap. An examination of the genitals showed that they were very red and excoriated from the constant irritation.

The prognosis is usually good if the habit is detected early and the cause removed if one exists. On the other hand, some cases will persist in spite of careful treatment, and nothing but heroic measures will effect a cure, as the following case will illustrate:—

An infant, female, was brought to me for the relief of this condition. The child had masturbated continually for several months and was so emaciated that the parents were alarmed. The condition was so bad that the child masturbated whenever the thighs were put together. A pad was improvised to separate the thighs and local applications of lead water on cotton were placed over the genitals to reduce the irritation. Large doses of bromides were administered to control irritability in the nervous system. The child was kept in a stupor for several days without having the condition relieved. The symptoms persisted and we finally were compelled to remove the child to the St. Marks Hospital where a clitoridec-tomy¹ was performed. The child made a rapid recovery. The habit did not reappear.

Treatment.—Remove the cause if any exists. All irritants, such as worms or eczema, should be treated. If an enlarged prepuce causes this condition, remove it. If a vaginal discharge exists, treat it with astringents, and thus avoid irritation. If worms are present, injections of quassia will dislodge them (see chapter on Worms). In older children we must remove the child from bad company, and sometimes it will be necessary to change the entire surroundings of a sensitive but well-meaning child. Ocean bathing is beneficial. The system should be strengthened by giving iron and strychnine. Clean habits, a rigid hygiene, and a daily bath are necessary. Strict supervision

¹ Archives of Pediatrics, May, 1899.

by night as well as by day with the aid of a trained nurse will do more good than medicine. Children once detected with this habit must never be permitted to sleep with their hands under the bedclothes.

P. S., 3 years old, was brought to my office for the relief of masturbation. It was a case of thigh friction. An adherent clitoris was found and smegma removed. The habit continued and the child was sent by me to Dowd of New York City, who advised a clitoridectomy. The operation was performed and relief given for several months. Later this case consulted me for a relapsed condition. Careful directions as to diet and hygiene were given and the same carried out. Relief was given by intraspinal injection of $\frac{1}{400}$ grain of atropia sulphate. After one injection the child remained well for a period of four months. A second injection was then given. In some cases a cure has been effected, in others where local irritation exists cases relapse.

Circumcision is one of the most valuable means of curing this habit. In females, especially in little girls, stripping the clitoris and cleansing the smegma, if present, will frequently modify this habit. If the habit persists in spite of this treatment, then a radical operation—clitoridectomy (see clinical cases given)—may be required. Intraspinal injections of atropia sulphate $\frac{1}{100}$ grain gave relief for four months in one of my cases. The diet should consist of milk, cheese, vegetables and fruits. Very little meat should be given.

III.

SPASMOPHILIA (TETANY).

THE modern conception of tetany, true laryngeal spasm, spastic apnea and convulsions is, that they are one and all part of the clinical picture known as spasmophilia. The condition is characterized by an irritability of the nervous system.¹

It is most commonly met with in early childhood, and distinguished by galvanic and mechanical hyperexcitability of the peripheral nerves; both tonic and clonic convulsions are frequently associated.

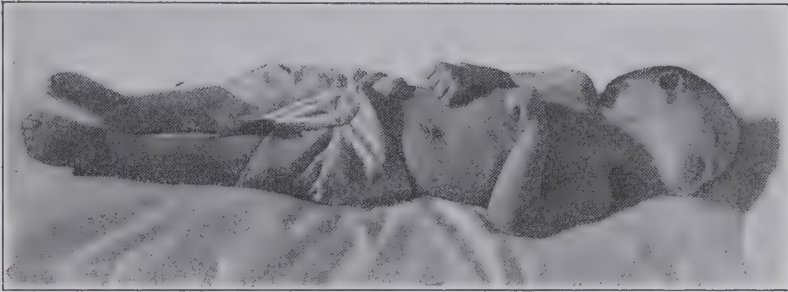


Fig. 238.—Tetany. Characteristic attitude of the hands resembling a rider reining in his horse. Note attitude of the toes. The wrists are rigid and flexed. The elbows are free. The fingers are flexed at the metacarpophalangeal joints. In this case facial irritability was best seen by constant spasm in the orbicularis palpebrarum.

Pirquet² has noted specific conditions: That in the normal infant the anodal opening contraction does not occur with less than 5 milliamperes. In spasmophilia the contraction by application of the Stinzing normal electrode applied over the median or peroneal nerves can be produced with less than 5 milliamperes upon the anodal opening. The reactions upon anodal closing and cathodal closing and opening are also frequently obtained with less current than in the normal child; that is, with less than two for cathodal closing, three for anodal closing, and five for cathodal opening.

¹ SEDGWICK, J. P.: St. Paul Medical Journal, Oct., 1912.

² PIRQUET: Galvanische Untersuchungen an Säuglingen, Verhandl. d. Gesellsch. f. Kinderh., Stuttgart, 1906. Bergmann, Wiesbaden, 1907.

By studying these reactions we have been able to learn that the underlying condition—namely, spasmophilia—is responsible for most of the convulsions in children, true laryngeal spasm, tetany, and spastic apnea. Thus, we may state that if an anodal or cathodal opening contraction with a current less than 5 milliamperes is present, *it shows that spasmophilia, latent or active, is present.* This condition is most common after the fourth month and is rarely found after the second year.

Etiology.—There is a diminution in the quantity of calcium salts in the brain, and a corresponding increase in calcium phosphates in the urine. Musser and Goodman found a high percentage of ammonia in the urine, rarely below 5 per cent. This output of ammonia bears a distinct relation to tetany. Berkley and Beebe believe that the parathyroids are concerned in furnishing enzymes which are of importance in the intermediary metabolism of nitrogen. Jacobson found an increase of ammonia in the blood and believes that such ammonia is sufficient to cause tetany and tremors. The removal of the parathyroids alone causes tetany. For this reason the extract of the thyroid gland has been advocated for the relief of this condition.

Symptoms and Diagnosis.—Gastrointestinal derangements in the artificially fed infant are responsible for most, if not all, forms of spasmophilia. Active symptoms of spasmophilia frequently disappear when an improperly artificially fed infant is put to the human breast.

If we tap the muscles of the jaw, a slight contraction of the face ensues. This is known as the *facial phenomenon*, and was first described by Chvostek. The contractions are first seen in the orbicularis palpebrarum.

The contraction resembles that caused by the sudden passage of a galvanic current. It is sometimes more marked on one side of the face than the other, and in some cases it is more noticeable in the upper—in others in the lower—half of the face. A similar contraction of the inner end of the eyebrow may often be caused by tapping on the temple. The wrists are rigid and flexed. The elbows are free. The fingers are flexed at their metacarpophalangeal joints. There may be a constant spasm, jerking in character, continually present.

A similar phenomenon is known as *Trousseau's sign*; if the arm is compressed by an elastic band the muscles of the fingers and sometimes of the forearm pass into the tetanic condition.

Haas¹ has recently called attention to a class of vomiting infants who have a definite clinical entity. Such he calls the hypertonic infant and of which he says: It is characterized by hypertonicity of all the skeletal muscles, as shown by the ability to raise the head and grasp objects even in the early days of life, and by general spasticity. "The hollow viscera shows increased activity of their smooth muscle fibers. This expresses itself in the form of spasm involving practically every part of the digestive tube, and, depending on the region, presents the symptoms



Fig. 239.—Tetany and marked atrophy due to acute milk infection. Four months old infant. Weight 4 pounds, 10 ounces. Referred to the Infanterium by the Red Cross, New York Chapter.

of colic, visible peristalsis, vomiting, constipation or any combination of these. Accompanying these symptoms is a marked psychic irritability expressed by insomnia, general restlessness and crying. The hypertonic infant belongs to the spasmophilic group.

Cases of this type present, in order of their importance:—

Vomiting, which, as before mentioned, is characteristically irregular, often with visible peristalsis.

Crying, which is often more or less violent.

¹ HAAS: Amer. Journal of Diseases of Children, May, 1918.

Insomnia, this is usually a striking symptom, and with the crying creates a household state or condition bordering on demoralization.

Constipation, resistant to ordinary laxative and dietetic treatment, and distinctly spastic in type. The first portion of the stool is hard, the balance softer.

Cold extremities, with pallor, cyanosis and subnormal temperature. This is met with only occasionally.

Underweight, the degree depending on the age at which correct treatment is instituted—under 8 weeks, one to one and one-half pounds.

Course.—The course of this disease is given by some authors as from a few days to several weeks. In one case observed by me at the Willard Parker Hospital (see Fig. 238), the tetanic spasms lasted for more than two months. Other cases seen by me lasted but a few days or weeks at the longest.

Prognosis.—The prognosis is excellent if the cause of the tetany is a gastrointestinal disorder.

There are instances in which death has ensued from laryngeal spasm or from general convulsions. When a very frail infant has severe tetany of the upper and lower extremities with retraction of the head, then the prognosis is bad.

Treatment.—The deficiency of calcium salts has given us a clue to therapeutics, showing that probable imperfect metabolism of certain mineral salts is responsible for this condition.

Atropine 1 grain, water 2 ounces makes a 1 to 1000 solution. Add 1 drop to each feeding. After forty-eight hours if no improvement, increase the dose to 2 drops. Rarely will a case require 3 or 4 drops.

Restorative treatment consists in giving phosphorized codliver oil.

R Phosphor: $\frac{1}{250}$ to $\frac{1}{100}$ grain.
Codliver oil 1 dram.

Sig.: Begin with $\frac{1}{2}$ dram. Increase gradually until 1 dram, three times a day, is given.

The diet is the most important part of the treatment. If the child has been on a milk diet then vegetables should be added. Spinach, baked potato, carrots, tomato, and fruit juices. If evidences of malnutrition exist in an underfed child then carbohydrates are required, such as rice, farina, oatmeal and barley.

The vitamin¹es contained in orange and tomato juice, in unpolished rice, and coarse grained breads such as graham or rye bread will aid in restoring normal metabolism. Eggs and meat, if the child is old enough, should be added to the dietary.

TETANUS (LOCK JAW).

This acute infectious disease is caused by the invasion of a specific micro-organism.

Etiology.—Any open wound on the surface of the body can be the point of entrance for these pathogenic bacteria.

There are some parts of our country in which the disease exists all the year round, provided the factors which cause the same, filth and dirt, are brought into play. A child infected with tetanus can transmit the disease; hence this should be borne in mind while a case is under treatment.

Bacteriology.—Nicolai¹er in 1884 found a specific micro-organism in the soil from which he infected animals and produced tetanus. He also found this germ present in patients affected with tetanus.

In 1898 Kitasato demonstrated this bacillus in pure culture. It was also found in infants suffering with tetanus. From the pure culture Kitasato and Behring produced an antitoxin.

The toxin generated by tetanus is a deadly poison. Kitasato found that an animal infected and left alone died in one hour.

Pathology.—Distinct lesions of tetanus cannot be demonstrated pathologically. An open wound and evidences of a general septic infection can usually be found. Hemorrhages of the brain or smaller hemorrhages in various parts of the body may exist. If the umbilicus has been the point of entrance, the wound will not heal.

Symptoms.—In the newly born the first symptom noticed is the refusal to take the breast. Owing to the rigidity of the muscles, the jaws will be found stiffened and feel hard to the touch. The same spasmodic stiffening will be made out in the other parts of the body. After a sudden stiffening the muscles usually relax. Muscular rigidity appears in paroxysms and may come on every few minutes.

The temperature varies between 101° and 104° F. or there may be hyperpyrexia reaching 107° F. The pulse is small,

¹ The Vitamin¹es; by Funk and Dubin, Williams and Wilkins, Baltimore, 1922.

feeble, compressible, and very rapid. Symptoms of malnutrition, such as emaciation, are very evident. Stadtfeldt reports 88 fatal cases; 83 of these died between the ages of six and ten days.

The following case illustrates tetanus seen in private practice:—

A female infant 15 days old was seen by me suffering with fever. The nurse said that she refused the breast. The infant was in good health apparently up to this time. The appetite was good, the bowels regular, no gastric disturbances existed. On examination the umbilicus was found inflamed and suppurating. The temperature was 102° F.; the pulse 160. The jaws were fixed. The infant had spasms, which grew more severe when she was handled. The body relaxed for a few minutes at a time.

The treatment consisted in cleansing the wound with strict asepsis, dusting aristol powder on the umbilicus, and protecting the same with a sterile bandage. The rectum and colon were flushed with warm saline solution. An injection of 5 cubic centimeters of antitetanus serum was given with the usual antitoxin syringe. As no effect was evident from the injection, a second injection of 5 cubic centimeters was administered twelve hours later. Symptoms of improvement followed and the child recovered.

A second case of tetanus was one caused by scratching an open wound situated near the nose, while playing with a canary bird. Symptoms of tetanus appeared two days after infection. Large quantities of tetanus antitoxin were injected with no beneficial result. The case ended fatally. In this case the infection was traced to some canary birds which were in the same room as that occupied by the family.

Prognosis and Course.—The duration of fatal cases is seldom more than one or two days. Those tending to recovery usually extend from one to three weeks.

While occasionally cures are reported, five out of ten seen by me have ended fatally. I have seen cases, both in this country and abroad, injected with sufficient antitoxin, end in recovery.

Treatment.—An injection of 30 cubic centimeters tetanus antitoxin should be given, and repeated every twelve hours until the toxic symptoms improve. In addition thereto, the bromides of potassium and sodium, chloral hydrate, belladonna, and opium are among the anti-spasmodics used. It is essential to give large doses or no effect will be produced. Calabar bean has been lauded by some authors and can be given hypodermically.

The literature records a great many cases where the antitoxin was injected directly into the sinus. In the newly born baby this method should be used, as there is no obstacle to the introduction of the needle through the open fontanel.

In one case treated by me the antitoxin was injected through the anterior fontanel into the superior longitudinal sinus.

EPILEPSY.

Epilepsy is frequently seen in very young children. Some writers state that it develops in children approaching puberty. I have seen epileptic spasms in children under 1 year of age.

Etiology.—True epilepsy is not associated with adenoid vegetations, phimosis nor masturbation. While foreign bodies in the nose, throat and ear may be associated the consensus of opinion is that these conditions do not cause epileptic convulsions. Likewise menstrual derangements, if existing, with epilepsy must not be looked upon as the prime reason for such attacks. Hypothyroidism is usually found in many female epileptics. In such cases one must assume that an inhibition of the activity of the ductless glands may be responsible for these epileptic attacks.

Idiopathic epilepsy is noted in children of alcoholic parentage. It may be possible that such chronic alcoholism induces a defective organization of the brain structure of their children.

According to Berkley, 33 per cent. of these cases give a history of alcoholism in one parent. Rachitic infants are frequently seen with epileptic seizures, so that it is quite possible that they are predisposed. Children who have suffered with convulsions in early life frequently have epilepsy later in life. This has led some authors to believe that convulsions and epilepsy are as cause and effect.

Undoubtedly many cases of this kind exist. Statistics prove, however, that one-half of all eclamptic children have no further nervous diseases in later life. Hence, we must not claim that if an infant suffers with eclampsia it must necessarily become an epileptic.

Traumatic epilepsy is frequently seen following an injury to the head, or accident. Falling down stairs or a sudden blow on the skull has been followed by epileptic convulsions.

Inherited syphilis is a less frequent factor. The signs of inheritance are chiefly seen in the departure from the normal in the skull formation, microcephalus, macrocephalus, as well as asymmetries of the skull and facial bones. Flatness of the cranial arch is found in a considerable proportion of epileptics, particularly among the males. Signs of rickets are especially

frequent in epileptic children. Aronsohn, in a study of heredity among 508 epileptics, found a history of neuropathic disease in the parents in 32 per cent. Females showed a stronger tendency to inherit the disease than males, 33 per cent. against 30 per cent. The disposition on the part of the mother to transmit epilepsy is greater than that of the father ($39\frac{1}{2}$ against 29 per cent. of inherited cases). Where both parents were hereditarily burdened, 63 per cent. of the children inherited the disease. In 82 per cent. of the inherited cases, the disease began before the twentieth year of life. Wildermuth, in 145 cases of early epilepsy, found inherited tendencies in 49 per cent., drunkenness on the part of the parents contributing nearly one-half (21 per cent.) of the examples. Traumatism in early life furnishes a small number of cases of epilepsy. Among 210 patients assembled by Wildermuth antecedent injury to the head had occurred eight times. In the majority of the traumatic cases, the seizures followed the injury within a few days or weeks, seldom after months. Berkley states that epileptiform seizures and their sequelæ are sometimes found where there has been antecedent meningitis, porencephalia, or cerebral hemorrhage in infancy; they may also result from acute infectious processes, but in these instances they are to be regarded not as belonging to true epilepsy, but as the symptomatic expression of a coarse, irritative cerebral lesion.

Pathology.—Gowers states that the disease is probably located in the gray matter of the cortex. It should be regarded as a muscular spasm, the result of the sudden overaction or discharge of the nerve cells.

Of 1450 cases of epilepsy studied by this same writer, 12 per cent. began during the first three years of life, and 46 per cent. between the tenth and twentieth years.

An interesting point was brought out by Herter and Smith, who studied 238 specimens of urine taken from 31 epileptics.

They noticed that in 72 of these observations there was excessive intestinal putrefaction, as shown by the presence of ethereal sulphates in the urine *just before the occurrence of the spasm*. These authors were warranted, therefore, in their conclusion, that there is a distinct association between the intestinal poisoning and the epileptic seizures. We can readily see that the treatment of any case of epilepsy must be followed along the lines just described.

Symptoms.—*Petit Mal Form.*—In petit mal there is a mild attack lasting but a few seconds, rarely more than one minute. The child does not fall. It is unconscious while the attack lasts. These attacks occur by day as well as night. An aura rarely occurs before the attack. In rare instances there may be a mild (petit mal) as well as a severe attack (grand mal) present.

Grand Mal Form.—The attack may come on gradually or it may be sudden. Children old enough to complain frequently have a warning of the attack known as the aura. This aura consists in a series of symptoms, such as a twitch in the leg or the face, constituting a local spasm described by some authors as a “motor aura.” Then again there may be abnormal sensations, such as a tingling or numbness in some part of the body, until the patient suddenly falls with the spasm. There may be an unusual tremor or a shivering sensation, and the patient may fall to the floor with a sharp cry, having the jaw set and all the muscles of the body in *tonic spasm*. The eyeballs are usually rolled upward. After a few seconds, during which the skin is cyanotic, a second stage follows, in which there are *clonic spasms*. There may be involuntary spasms of the bladder and bowel. In the clonic stage the muscles frequently contract and relax violently. Not infrequently the tongue is apt to be caught between the teeth and is bitten. There may be frothing at the mouth. Very marked rigidity of the sterno-cleido-mastoid. The head may be thrown backward or it may be twisted to one side. The extremities may relax and then become rigid again, and the cyanosis gradually disappears. Children usually fall into a deep sleep as though exhausted after the end of the clonic stage. This sleep lasts hours at times. Children old enough to describe symptoms will state that they have no knowledge of what has happened. They awake just as children do after a deep chloroform narcosis.

Differential Diagnosis.—Epilepsy is frequently confounded with hysteria. In hysteria there is partial consciousness. In epilepsy there is a total loss of consciousness. The biting of the tongue and symptoms, such as the nocturnal appearance of the attacks, will aid in establishing the diagnosis. There is usually a dilatation of the pupils.

An epileptic may have an attack and fall in inopportune places, such as the street or on a hot stove. A case of hysteria usually selects a place indoors, entirely out of danger. Instances are on

record where epileptics have fallen into the water and were asphyxiated during the spasm.

Prognosis and Course.—This disease does not follow a regular course. The usual interval between seizures in the very beginning may be months. Regular intervals of epileptic attacks may be every two or four weeks. In some severe cases seen by me the attacks came on every day. It is not unusual for epileptic seizures to come at night only. When such is the case, the diagnosis is very difficult.

Treatment.—When a specific reason for epileptic attacks exists such as intestinal toxemia, then strict dieting aided by eliminatives should be ordered. Intestinal stasis in a constipated child permits toxic products to enter the circulation, and these may irritate and excite the central nervous system. A light non-constipating diet is therefore indicated.

To counteract intestinal putrefaction a fresh liquid culture of the *Bacillus acidophilus* or a culture of the Bulgarian bacillus, taken three times a day, is indicated.

The daily tub bath aided by cold showers and friction will stimulate the circulatory system and keep the child from having hyperemia due to stagnant circulation.

Exercise, fresh air and water to aid diuresis should be ordered. Stimulating foods such as coffee, tea, and alcoholics should be strictly forbidden.

Epileptic children may be permitted at school but the teacher should be informed of the child's tendency to spasms so that she can co-operate with the physician in the intelligent supervision of each case.

When attacks recur at daily intervals it may be well to discontinue all study for a month or more.

Dietetic Treatment.—Cereals, vegetables, and fruits, in fact, the lightest kind of dairy products, should be ordered. Meat and similar stimulating nutrition should be prohibited. Water and liquids should be freely given.

Drug Treatment.—Triple bromides may be given, or sodium bromide in 5- to 10- grain doses every three hours until the spasms cease. The bromides should be continued for several months after the cessation of the attacks, but the dose should be reduced to one-half of that given during the spasms. Chloral hydrate may be given in conjunction with the bromides. The usual dose is 3 grains of chloral to the given dose of bromide.

Crotalin is the dried venom taken from the fangs of the American rattlesnake. It is well spoken of by some writers in the treatment of this disease. It is injected into the back of the forearm in $\frac{1}{200}$ -grain doses.

Surgical Treatment.—According to Sachs and Gerster an operation is permissible in traumatic epilepsy when the case is not over 1 or 2 years old. When there is a depression of bone, the operation is indicated at a later period; but should not be delayed. Trephining alone is sometimes sufficient. If the disease is of short duration, a part of the cortex may be incised. The complication of infantile cerebral paralysis, if the case be recent, is no contraindication to the operation. It must not be performed in epilepsy of long duration.

In a case due to a traumatic or organic lesion an early operation may prevent the development of cerebral sclerosis. If an early operation is not done, the occurrence of epilepsy is a warning that secondary sclerosis has been established and an operation may prevent it from increasing. Operation must include the removal of the diseased area; hence, if all other parts are normal, a cure may result.

An operation is indicated in suspected organic focal disease of the brain. If meningeal hemorrhage due to traumatism is suspected, an operation will do good if performed early. Concerning the excision of a piece of the cortex to remove a scar, G. Jacoby does not believe any permanent benefit is derived therefrom, because a larger scar results.

Decompression aims at relieving intracranial pressure and is very successful in many cases when operated early.

Lumbar Puncture.—Recurring spasms indicate marked intracranial pressure. When bromides and other antispasmodics do not relieve them a lumbar puncture should be performed. The withdrawing of 25 to 40 cubic centimeters of spinal fluid has frequently modified the character and frequency of epileptic spasms.

ACUTE MYELITIS.

This condition consists in a diffuse inflammation resulting in destruction of spinal elements and the softening of the cord.

Etiology.—It is not a rare condition, but is most frequently seen as a complication of the infectious diseases. Chilling of the surface of the body seems to favor the development of this

condition. Some authors state that it follows metallic or other chemical poisonings. It is frequently associated with spinal trouble, such as Pott's disease. Injury is frequently given as a cause, but syphilis is the most frequent cause.

Pathology.—The cord is seen thickened and surrounded by hyperemic meninges. The substance of the cord is much softer than normal and sometimes resembles pus. Frequently small, punctate hemorrhages and even larger extravasations of blood can be seen microscopically. In severe disintegration of the cord, the microscopical findings are useless. It is in the mildest forms that pathological changes can best be studied. In the dilated blood-vessels we find leucocytes and granules of myelin. Corpora amylacea are frequently seen.

Symptoms and Diagnosis.—The symptoms depend on the portion of the cord tissue involved, and on the severity of the process. In syphilis we have a slowly developing condition weeks and months before myelitis symptoms pointing to this condition can be noticed. If children can complain they describe a sense of weight in the legs, which gradually increases, so that in a few days the limbs are entirely palsied. Convulsions and delirium have frequently been noted. When the reflexes are anatomically related to the affected segments they disappear, and below that level they are increased; after a few days, if the cord has been entirely destroyed at the inflammatory focus, the reflexes are entirely abolished (Church). Provided the posterior roots and meninges are involved, pain in the back and limbs is a prominent symptom, but rarely is of an excruciating character at the onset. At the upper level of the inflammation some pain is the rule, which gives rise to a band or girdle sensation and a zone of hyperesthesia about the abdomen or chest. This sign, with the paralysis, definitely localizes the upper limit of the lesion, but if it be in the lower cervical region this sensation passes down the arms and is not so sharply defined. Lesions in the cervical region are also marked by implication of the cilio-spinal center, with consequent dilatation of the pupil. Continuous priapism is then, too, a usual occurrence, and the intercostal muscles and heart may be affected. Below the lesion, and depending upon its intensity, there are variations in sensibility to all forms of stimulation, from slight blunting to the usual complete anesthesia. Sensations of drowsiness and aching in the paralyzed and anesthetic limbs are sometimes mentioned;

and cramps and drawing up of the limbs frequently occur early, and later are the rule. Distinct muscular atrophy related to the portion of the cord affected takes place, but in the trunk it is not readily discernible. The paralyzed limbs during the first few days are abnormally warm, but soon present a subnormal temperature; sluggish circulation and emaciation ensue, with edema of the feet and legs if the limbs are left any length of time in a pendent position. If the lesion is low down, the atrophy is a marked feature and the reaction of degeneration is present. Under the influence of pressure, bed-sores form on prominent portions of the body and limbs, and this very early. In some cases within the first week immense sphacelization may take place over the sacrum, which cannot be explained by pressure and the moisture from the urine, but implies a dystrophic condition of cord origin. Trophic symptoms (bed-sores) are especially liable to occur when the lumbar cord is the seat of the disease.

A Wassermann test should be made, either by an examination of the blood or of the spinal fluid. If the result is positive then neosalvarsan or silver salvarsan should be used.

Prognosis and Course.—The course of the disease is chronic. The condition varies but little. The symptoms get worse and worse until death ends the trouble. From a few weeks to a few months may terminate the disease.

At times if it is associated with or dependent on Pott's disease, improvement may be expected. Sometimes myelitis is caused by syphilis either in its active form or due to a syphilitic neoplasm. It is rare in such conditions to effect a cure.

Treatment.—The use of neosalvarsan or silver salvarsan has given me good results. Care should be taken to observe all rules of asepsis and sterility as advocated by the research laboratories. If specific conditions such as syphilis exist, then antiluetic treatment is required. Iodide of sodium can be given in very large doses, 5 to 50 grains per day. The general indications, such as attention to the stomach and bowels, must be met and stimulated if required. It is important to feed a patient in this condition with very nutritious food. Counter-irritation over the spine is advisable. For this purpose tincture of iodine or mustard will be useful. I insist on absolute rest in bed (water bed if possible) and in frequent change of position.

CHRONIC MYELITIS.

This condition follows the acute myelitis wherein treatment had been neglected. Trophic symptoms such as bed sores are usually present. In chronic myelitis we have softening of the cord and symptoms of paralysis and atrophy that usually terminate fatally.

Treatment.—Nutrition and neosalvarsan or silver salvarsan are the only measures that offer a ray of hope. The prognosis is usually fatal.

MALFORMATIONS OF THE SPINAL CORD (SPINA BIFIDA).

The most frequent malformation seen is spina bifida. It affects the vertebral canal and ends in a protrusion of a small or large soft tumor filled with serum. This serum is a clear, yellowish liquid similar to cerebro-spinal fluid.

Pathology.—Spina bifida is due to an early failure in development, in most cases before the cord is segmented from the epiblastic layer from which it is developed. Hence, it remains adherent to the epiblastic covering, and the structures which should be formed between the cord and the skin are developed. For this reason we have in the wall of the sac a fusion of the elements of the cord, nerves, meninges, vertebral arches, muscles, and integument. If the error in development occurs later, the cord and nerves may be attached to the sac, but not intimately fused with it; in still other cases the cord does not enter the sac at all. The malformations may occur before the central canal is closed, or, if closed, it may reopen from the accumulation of fluid. It is probable that the accumulation of fluid first occurs, and that this prevents the union of the parts of the vertebral arches.

Although the tumor is generally associated with a bifid spine, this is not necessarily the case. The protrusion may take place through the intervertebral notch or foramen, or there may be a fissure of the bodies of the vertebræ, and an anterior tumor projecting into the cavity of the thorax, abdomen, or pelvis, spina bifida occulta. The principal anatomical varieties are meningocele, meningo-myelocele, and syringo-myelocele.

Symptoms.—There are no specific symptoms other than the evidence of the growth in the lumbar region. There is danger of the spina bifida bursting and permitting an infection. Even though the parts are protected there is danger from traumatism.

The following case of spina bifida occurred in my private practice. A boy, 6 years old, was brought to me with a history of having a very large growth in the lumbar region. The sac burst spontaneously. Since that time the boy has a double paralysis, and also suffers with incontinence of urine and feces. He was brought to me for the treatment of the paralysis. The general condition was good and he appeared well nourished. There was no evidence of hydrocephalus.

Treatment.—The treatment of spina bifida is surgical. Aspiration of the sac and emptying the same is palliative treat-

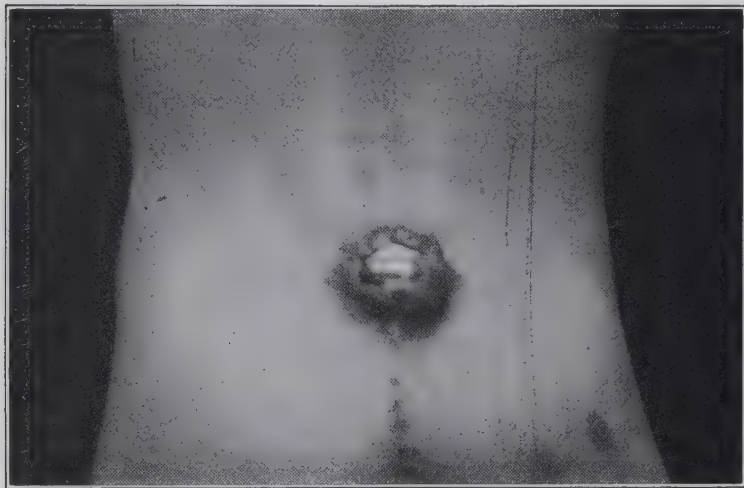


Fig. 240.—Case of spina bifida. Spontaneous cure. Male child, 6 years old. Now suffers with paralysis of both legs. Well nourished. No evidence of hydrocephalus.

ment. Success has been seen by me after radical operation. There is danger of delay as the clinical case cited above illustrates.

HEREDITARY ATAXIA (FRIEDREICH'S DISEASE).¹

This condition is caused by degeneration of the posterior columns of the spinal cord. As a rule several members of the family are affected.

Etiology.—This disease is usually seen at or about the period of puberty. Measles, scarlet fever, or any other acute infectious disease may precede the development of this condition.

¹ I am indebted to Williams's excellent monograph for some points in this article.

Pathology.—The lesions seen are: Sclerosis in the posterior columns (columns of Goll in their whole extent, and columns of Burdach in their upper part), in the direct cerebellar tract extending laterally into the column of Gowers, in the lateral columns (crossed pyramidal tract), in the gray matter (columns of Clarke, and posterior horns). In some cases dilatation of the central canal has been observed.

Symptoms and Diagnosis.—The motor system shows the most characteristic symptoms. The patient stands with the feet far apart. The body sways and there is an unsteadiness while trying to maintain the equilibrium. The gait resembles that of an alcoholic intoxication. A tremor of the hands and head and choreiform movements affect the same parts. Paralysis and emaciation may be present. The tendon reflexes are absent as a rule, but their presence does not speak against the diagnosis in the early stage of the disease. The eyes show nystagmus. There is no optic atrophy. There is vertigo. The speech is slow. The intellect seems impaired. There is a peculiar clubbing of the feet. The foot is short. The toes are over-extended, the instep high and hollow. The Babinski phenomenon, or hyper-extension of the big toe, may be the first symptom of this condition.

The prognosis is grave. The disease lasts years.

Treatment.—The disease runs its course, although electricity and restorative treatment plus massage may be tried. The disease usually ends fatally.

POLIOMYELITIS (INFANTILE SPINAL PARALYSIS).

This disease is characterized by a sudden onset of fever, then paralysis, usually followed by muscular atrophy and imperfect bone development, sometimes by deformity.

Flexner and Noguchi¹ show that poliomyelitis is due to a distinct micro-organism which can be isolated from the human poliomyelitic virus. The micro-organism exists in the infected and diseased organs; it is not, as far as is known, a common saprophyte, or associated with any other pathological condition; it is capable of reproducing on inoculation the experimental disease in monkeys, from which animals it can be recovered in pure culture. Besides these classical requirements, the micro-organ-

¹ Journal of Experimental Medicine, vol. xviii, No. 4, 1913.

ism withstands preservation and glycerination as does the ordinary virus of poliomyelitis within the nervous organs. Finally, the anaërobic nature of the micro-organism interposes no obstacle to its acceptance as the causative agent, since the living tissues are devoid of free oxygen and the virus of poliomyelitis has not yet been detected in the circulating blood or cerebrospinal fluid of human beings, in which the oxygen is less firmly bound, nor need it, even should the micro-organism be found sometimes to survive in these fluids.

Now that the specific cause of infantile paralysis has been found, it is but rational to assume that a specific serum or vaccine will be made, such being possible, we may then hope, with specific treatment in the preparalytic stage, to prevent the paralysis.

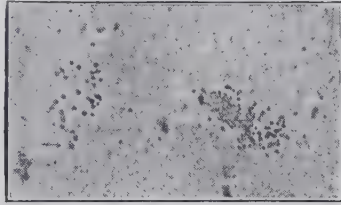


Fig. 241.—Micro-organism causing epidemic poliomyelitis. Separate globoid bodies. $\times 1000$. (Courtesy of *Simon Flexner*.)

Childhood is the age most susceptible to an infection of poliomyelitis. During the epidemic of 1916, New York City had over 9000 cases. The death rate was about 26 per cent. Connecticut and Maine each had nearly 700 cases; New Jersey about 3500 cases, Pennsylvania about 1300 cases, and New York State, excluding New York City, about 2800 cases.

Pathology.—One of the facts now established is that the inflammation of the cord is always accompanied by an inflammatory process in the pia mater. The pathological process in the cord itself is primarily dependent upon vascular changes, and secondarily, upon changes in the cells, both ganglionic and interstitial. The vessels of the cord, medulla, pons, basal ganglia, and even the cerebral cortex are dilated and engorged, and in the cord, medulla, and pons the capillaries are distended to more than twice their normal caliber. This hyperemia is found at all levels of the cord irrespective of the intensity of the other inflammatory changes. It is now firmly established that the

pathological process in acute poliomyelitis is one which is primarily dependent upon the vascular and interstitial tissue changes and that the ganglion cells are secondarily affected. (I. Strauss.)

According to Peabody, Draper, and Dochez, cellular exudate, hemorrhage, and edema, . . . may perhaps be regarded as the primary reaction of the nervous system to the virus of poliomyelitis. The damaging effects can be assumed to result in part from the direct pressure on the nerve cells of hemorrhages, edema, and exudate. These observations were made at autopsies.

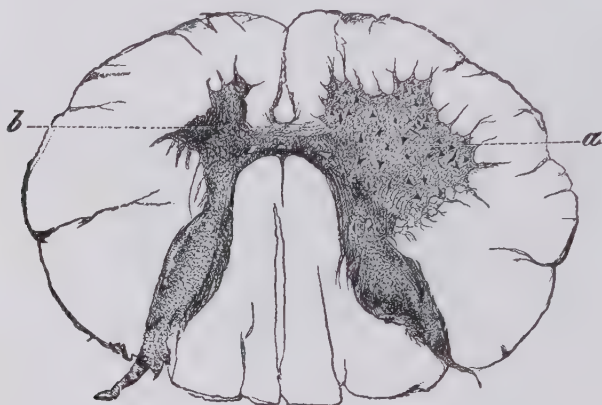


Fig. 242.—Poliomyelitis. Sclerosis and cicatricial atrophy of the left anterior horn of the fourth cervical nerve after acute anterior poliomyelitis. (a) Normal anterior horn with ganglion cells. (b) Atrophic anterior horn. (Ziegler.)

Symptoms and Diagnosis.—There is a sudden onset of symptoms. In the abortive type we have a series of mild symptoms which may pass unnoticed. The temperature may rise no higher than 101° F. and last but one or two days. The child will be apathetic, complain of headache, and have extreme lassitude. He may also complain of pain in the arms and legs. In some forms of the abortive type the symptoms will pass after one day, the child will regain his appetite, and be as bright as usual. The reflexes may be slightly exaggerated, but there are no other evidences of paralysis.

During an epidemic they are the carriers of this infection. As a rule the disease begins suddenly. A child will attend school in the morning, in apparent good health. Will have a headache

at noon. Fever ranging between 103° and 105° F. A pulse ranging between 120 and 140. Intense pains on moving the arms and legs, or on rotating the head. There is a general apathetic condition. The sclera of both eyes show engorged blood-vessels, the eyes stare or are fixed, the pupils respond slowly, the patellar reflexes are exaggerated or are lost, the child appears to be in a stupor or semi-comatose condition, usually followed by paralysis. There is usually vomiting and intense constipation. The above symptoms are found in the gastroenteric type.



Fig. 243.—Paralysis of the muscles of the back, trunk, and neck. Cannot sit unsupported. Case studied at Willard Parker Hospital during epidemic of 1916.

In the milder forms of this type we have symptoms resembling rhinitis with fever ranging between 102° and 104° F., cough, peevishness, restlessness, and general prostration. In the severer forms we have symptoms *resembling bronchopneumonia*: high fever; shallow, frequent respirations ranging between 50 and 80 per minute, pulse of 130 to 150 per minute, extreme lassitude, weakness or absence of knee-jerk, and evidences of profound toxemia. Paralysis of the respiratory centers frequently follows. The above symptoms are found in the respiratory type.

In the bulbar type we have inability to swallow or speak, marked rigidity of the sterno-cleido-mastoids, with intense pain in the head and neck, moaning usually preceded by convulsions, both tonic and clonic in character. The muscular system of the arms and legs shows intense rigidity. The Kernig sign is sometimes present, and more frequently marked hyperextension of



Fig. 244.—Paralysis of the spinal muscles and intercostals, showing involvement of the serratus magnus. Case studied at Willard Parker Hospital during epidemic of 1916.

the big toe (Babinski) is noted. The pupils respond sluggishly and are unusually contracted. All the symptoms of a meningitis, such as a *tache cérébrale* and Brudzinsky's sign described elsewhere, are present. In the early stages the patellar reflexes may be slightly present, but later are absent. The plantar reflex is usually present. The cremaster reflex slightly present. Paralysis usually takes place after the febrile condition subsides. The

duration of the fever is from three to six days, although I have seen cases in which the fever persisted ten days. The above symptoms are noted in the bulbar type of this disease.

Preparalytic Symptoms.—During the febrile stage, if the child is carefully observed, we can frequently note an important symptom which has been described by Colliver¹ as a preparalytic



Fig. 245.—Poliomyelitis showing facial paralysis.

symptom. It is a peculiar twitching, tremulous or convulsive movement. It usually affects a part or whole of one or more limbs, the face or jaw. It may also affect the whole body. In the beginning the symptoms may last less than one second, and may not recur oftener than every hour or so. Later the spells lengthen to a few seconds, and recur at shorter intervals. The condition is sometimes accompanied by a peculiar cry, similar to the hydrocephalic. During the convulsive movement the child

¹ Journal of the Amer. Med. Assoc., March 15, 1913.

is apparently unconscious, with eyes set for a few seconds. A similar symptom has been described by Netter,¹ of Paris. This preparalytic symptom, if noted, will serve as a warning of the approaching paralysis, and when observed, the limb should be strengthened by support. Flexing the spine anteriorly induces pain and stiffening of the neck. All lymph glands are enlarged.

Eruption.—In many cases a pin-point erythema (scarlatiniform) scattered over the chest, abdomen, and flexor surfaces of arms was seen. Sometimes the rash appears as urticarial blotches or wheals, principally on abdomen, back, thighs, and arms. In these cases toxic, gastric, or gastroenteric symptoms are found. Another type of eruption seen is the morbilliform type. The eruption crescentic in character is found on face, neck, thorax, and a few scattered areas are seen on the arms and legs. The eruption usually lasts from three to ten days, and fades with the fever.

Lumbar puncture² should be made to verify the diagnosis. Fifteen to 25 cubic centimeters of spinal fluid should be withdrawn. If the fluid comes out under great pressure, then 50 to 100 cubic centimeters may be withdrawn.

Spinal Fluid.—According to the findings of the New York Board of Health,³ the spinal fluid in poliomyelitis is usually clear and increased in amount. The albumin and globulin are increased in varying degrees, and there is usually a good reduction of Fehling's. The cellular increase ranges from slightly above normal to over 900 cells per cubic centimeter. Early in the disease the cells may be 50 per cent. or more mononuclears. Later there is usually 90 per cent. or more mononuclears. There are frequently large mononuclear cells that seem somewhat characteristic of these fluids.

In the abortive cases there is an increase of the leucocytic element. In the beginning an increase in the polynuclear cells, later an increase in the mononuclear cells or still later 100 per cent. lymphocytes. Globulin in the early stage of the disease is usually negative, whereas, later it is positive.

The incubation period has been established at two weeks. The quarantine period of children who have been exposed to infection is fourteen days from the date of last exposure.

¹ British Jour. of Children's Diseases, Dec., 1913.

² The technic and illustration of lumbar puncture is described on page 944.

³ JOSEPHINE B. NEAL: Archives of Pediatrics, August, 1916.

Prognosis.—The prognosis should be very cautiously given. These cases assume a chronic character. Improvement may take place early or it may be delayed months. Persistent treatment will frequently be rewarded by success.

Treatment.—Fifteen cubic centimeters of blood serum from a convalescent or immunized case of poliomyelitis should be injected intraspinally by the gravity method as soon as procured.¹ One injection of serum is usually sufficient, although the same dosage may be repeated in twenty-four hours if no improvement is noted. I have used intraspinal irrigations of normal saline solution at a temperature of 110° F. to 112° F. in a series of cases with excellent result. Several moribund cases responded promptly to this form of treatment. The needle is introduced between the fourth and fifth lumbar vertebræ, and as much as possible of the spinal fluid withdrawn. Thirty to 100 cubic centimeters have been withdrawn at one time. After draining, 30 cubic centimeters of the saline solution is injected. This is repeated three times. After the third drainage, 15 cubic centimeters of blood serum from a convalescent case is injected, the needle withdrawn, and the puncture sealed with a drop of collodion or medicated adhesive plaster.

Meltzer advises the injection of 2 cubic centimeters of a 1:1000 adrenaline solution. The adrenaline injection may be repeated every four hours during the first day, and if improvement is noted, every six hours, and later every twelve hours on successive days.

Muscular rigidity, accompanied by pain, is best relieved by warm sulphur baths. The crude sulphuret of potassium, 4 ounces to a tub bath at a temperature of 103°, will frequently relax the body and promote sleep. In some cases it will be found necessary to prolong the bath fifteen to twenty minutes to produce an effect. These baths should be given morning and evening for at least one week.

In the bulbar type with extreme prostration and coma, where it was impossible to feed by mouth, I have used injections of warm saline solution, 250 cubic centimeters, every four to six hours, by hypodermoclysis. In one case of coma with inability

¹ This method was advocated by A. Zingher, of the New York Board of Health, Research Department, during the epidemic of 1916. I have had excellent results with the same.

to swallow the child received 250 cubic centimeters of saline solution in the loose cellular tissue of the abdomen with excellent results. Hot saline colonic flushings at a temperature of 110° F. to 115° F. were given to supplement the hypodermoclysis.

In older children "muscle training" is commended and the child guided through active exercises, so that atrophy from non-use is prevented.

A comparison of this latter method of muscle active treatment, rather than the muscle passive treatment, which latter results from splints, braces, and plaster casts, shows a decided leaning toward the muscle active treatment. Patience and persistence will be rewarded by success after weeks and months of this treatment. The child's brain must be in sympathy with its movements; hence, the passive exercises, such as gymnastics or massage, are far inferior to a method by which the child can be instructed in the performance of various exercises in which the body and mind co-ordinate. It has been found by clinical experience, and such cases have been reported by Teschner and others, that a muscle, be it ever so atrophied, can be redeveloped by a system of carefully planned exercises. Electricity or galvanic current may be used in conjunction with massage, but gentle massage will accomplish just as much, and more than violent rubbing by inexperienced hands.

Exercise should be taught and practiced before a mirror. This form of treatment exerts a psychic influence on the child. Frauenthal has advocated this form of treatment with remarkable success at the Hospital for Joint Diseases. Muscle education is the keynote of success.

Medicinal Treatment.—Intramuscular or intravenous injections of one-half the usual dose of salvarsan given as a restorative may be tried. The dose should be repeated every week until the systemic effect of the salvarsan is manifested. Intramuscular injections of strychnine in doses of $\frac{1}{100}$ grain every other day gradually increased until $\frac{1}{50}$ grain can be given to a child 5 years old, younger children in proportion. Arsenic in the form of Fowler's solution may be given in doses of 1 to 5 drops three times a day.

The treatment must be directed toward elimination of toxin as much as possible. Urotropin (which liberates formaline) may

be given in 2- to 3- grain doses several times a day. Hot packs over the affected parts have a stimulating tendency.

Restorative treatment should consist in giving concentrated food, such as milk, yolk of egg, broth, and gruel. Seabaths will aid in restoring normal conditions. The treatment must be persisted in for months.



Figs. 246 and 247.—Paralysis of the left leg and foot. Typical drop-foot. Note position of the foot in standing—due to paralysis of the quadriceps muscles.

Prevention of Drop-foot.—When it is evident that a group of muscles is weakened, a support is necessary. Tubby says that recovery is always hindered and even entirely prevented in a stretched muscle, whereas when it is relaxed the reverse is the case. Therefore, in order to obtain the best result in an affected muscle, relax it to its fullest extent and massage it.

Elongated muscles are earliest restored to power and use by maintaining them slack. Muscles not paralyzed will contract. George W. Jacoby recommends, as a prophylaxis for drop-foot, placing the foot in rectangular position by means of bandages

and splint to prevent contracture. The weight of bed clothes should never rest on the foot.

In cases of drop-foot or drop-wrist, tenotomy may be required, but this should be left to the judgment of a conservative orthopedist. Muscle transplantation is advised after paralysis is firmly established.

ERB'S PALSY.

This is commonly known as obstetrical paralysis, and is caused by pressure exerted on the brachial plexus during birth. One or both arms may be involved.

Brachial plexus paralysis is amenable to treatment. An interesting case of this kind occurred in the practice of D. P. Waldman, of this city, with whom I saw the case in consultation. The infant was born after an unusually protracted labor with complete unilateral paralysis involving the right arm. With the aid of general manipulation and faradic electricity the case completely recovered. The duration of the attack was, from onset to cure, about three months.

Treatment.—The treatment, as a rule, consists in using gentle massage daily; also a mild faradic current every other day. If there is no response to this treatment within ten days the galvanic current should be tried. Tub baths at temperature of 102° F. duration one minute should be given prior to each massage.

HYDROCEPHALUS.

This is an accumulation of serum in the head.

External Hydrocephalus.—When the effusion is between the dura mater and the pia.

Internal Hydrocephalus.—When the lesion is in the ventricles of the brain. The latter condition is most commonly seen.

ACUTE HYDROCEPHALUS.

This condition usually follows basilar meningitis. In acute hydrocephalus the effusion is not large. Some authors state that no more than three or four ounces of serum are present.

CHRONIC INTERNAL HYDROCEPHALUS (WATER ON THE BRAIN).

This condition must not be confounded with tuberculous meningitis.

Etiology.—The cause of primary or secondary internal hydrocephalus is very difficult to determine. In some instances syphilis has been given as the causative factor. An interesting paper has appeared by D'Astros,¹ who describes 12 cases in which hydrocephalus was associated with syphilitic lesions, so that the condition was congenital. By some, chronic hydrocephalus is believed to be due to tuberculosis.



Fig. 248.—Case of chronic internal hydrocephalus. Note the position of the eyes and the globular shape of the head. Aspiration of the ventricles every week gave 50 to 60 cubic centimeters of a perfectly clear fluid.

Pathology.—The changes in the brain result from the gradual accumulation of fluid in the ventricles. The septum lucidum is usually broken down, and all the avenues of communication between the ventricular cavities are greatly enlarged. The continuous distention results in a gradual thinning of the brain substance which forms the ventricular walls; often these are found

¹ *Revue Mensuelle des Maladies de l'Enfance*, Chapter IX, pp. 481 and 543.

only one-fourth of an inch in thickness, or even less than this, the cortex being a mere shell.

The brain appears anemic, so that the gray and white substances resemble each other. The bones of the skull show the lesions very plainly. The sutures are separated in some cases. Where premature ossification has taken place, the head instead of being very large, is very small. This is called a micro-



Fig. 249.—Front view of same case. Note position of eyes and ears. This is a characteristic expression of hydrocephalus.

cephalic condition. Sometimes spina bifida is associated with this condition.

Symptoms.—The first symptoms that attract attention are, that the head is increasing in size; that it seems very heavy; that the child appears stupid; that it does not notice things, but stares continuously. The forehead is very high, the fontanel distended and bulging. On palpating, the soft fluctuating liquid can be felt. The sutures are very wide apart. The pupils are usually enlarged, sometimes contracted. Convulsions are frequently present. While the head enlarges the body emaciates.

Prognosis and Course.—This disease usually terminates fatally about the seventh year. In rare instances the condition may extend through life with impaired mental faculties due to the brain trouble. Cases that have been reported cured should be viewed with suspicion.

Treatment.—Decompression is advised.

Blistering, counter-irritation, strapping, and lumbar puncture have been tried by me with no apparent success.

In a case seen in consultation convulsions were relieved by lumbar puncture.



Fig. 250.—Hydrocephalic calvarium (or skull-cap), widely gaping fontanelles and sutures. One-half natural size. (*Langerhans.*)

Mercurial inunctions and large doses of iodide have been tried without specific result. If syphilis is the cause, then some benefit may be expected from specific treatment with neosalvarsan.

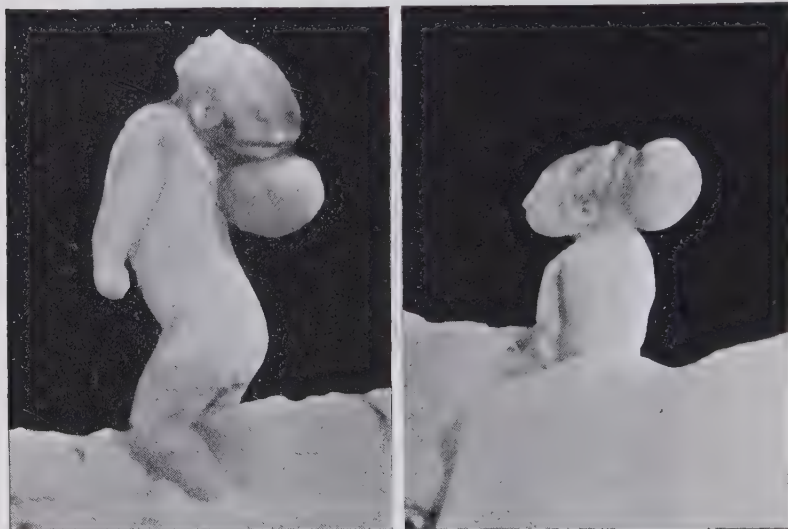
MENINGOCELE.

When there is defective ossification in the bones of the skull and some part of the membranes of the brain protrudes, it is called a meningocele. Some writers believe it is caused by an intra-uterine hydrocephalus. These tumors generally contain cerebrospinal fluid in the bag of membrane. When pressure is

exerted over the swelling, the liquid will be emptied into the brain. Sometimes cerebral symptoms will result from this manifestation.

ENCEPHALOCELE (CEREBRAL HERNIA).

In this condition there is a protrusion of the brain substance in addition to the membrane. This protrusion takes place through the frontal and occipital bones. It is usually a con-



Figs. 251 and 252.—Encephalocele. Infant 1 day old, admitted to my hospital service, having a globular tumor in the occipital region of the head. The tumor measured $8\frac{1}{2}$ centimeters from above downward, and $8\frac{1}{4}$ centimeters from side to side. The autopsy was performed by John Larkin.

genital deformity. If the tumor contains a portion of a dilated ventricle and is filled with cerebrospinal fluid, it is called a hydro-encephalocele or hydro-encephalo-meningocele.

A case of this kind was seen by me some time ago in which the tumor protruded through the occipital bone. It was a congenital deformity. Distinct pulsation could be felt. The tumor increased in size when the child cried. Convulsions resulted from forcibly pushing the tumor into the cranial cavity.

Treatment.—The injection of 1 dram of Morton's fluid after aspiration of some of the liquid contents may be tried.

MORTON'S FLUID.

| | | |
|----|--------------------------------------|------------|
| R | Kali iodide | 30 grains. |
| | Iodine pure | 10 grains. |
| | Glycerine | 1 ounce. |
| M. | Inject 1 dram after each aspiration. | |

If no improvement is noted after some time, surgical treatment should be tried.

CYCLOPS.

This is a very rare condition and consists of the child having but one orbit, which is situated in the middle of the forehead at the root of the nose.

PORENCEPHALY.

This consists usually of a defective development, leaving a hole in the brain. It is a congenital disease and may be located in any portion of the brain.

IV.

TUBERCULOUS MENINGITIS (BASILAR MENINGITIS).

THIS is usually a secondary condition. It is not a primary disease of the meninges. In infants, tuberculous meningitis usually follows bone tuberculosis, tuberculosis of the lymph nodes or joints, and not infrequently a tuberculous otitis may extend and involve the meninges.

Etiology.—The association of adenoid vegetation and the probable entrance of the tubercle bacillus through the lymph channels of the neck is the most probable means of infection. (See article on Acute Tuberculosis.)

Bacteriology.—There is no question about the association of the tubercle bacillus with this infection. It can be found in the spinal fluid withdrawn by a lumbar puncture. Other pathogenic bacteria may also be found. In one case reported by me we found the diplococcus intracellularis in addition to the tubercle bacillus.

Pathology.—The chief pathological condition is a growth of miliary tubercles. Associated with these we frequently find tuberculous nodules of variable size, and in almost every case are the products of ordinary inflammation of the pia mater—lymph or pus—together with an accumulation of fluid in the lateral ventricles of the brain. Holt says: Frequently there are tubercles in the pia mater of the upper portion of the cord. The miliary tubercles appear as small gray or white granules, situated along the vessels of the pia mater. When few in number they are usually located at the base, especially along the Sylvian fissures and in the interpeduncular space. When numerous, they are most abundant at the base, but are also seen scattered over the convexity in small groups. In about half of my autopsies they have been limited to the base, and in no case were they seen exclusively at the convexity. Tubercles are often found in the choroid coat of the eye. The amount of lymph and pus present is rarely great, and never equal to that seen in simple acute meningitis. It is often a matter of surprise at autopsies to find the lesions so few, after very marked symptoms. The inflam-

matory products are most abundant at the base. In addition to the patches of greenish-yellow lymph, there are adhesions between the lobes of the brain and thickening of the pia. In cases which have lasted for several weeks, the pia mater in places is often very much thickened, owing to cell infiltration and the production of new connective tissue, and it is studded with miliary



Fig. 253.—Tuberculous spinal meningitis. Longitudinal section of spinal cord and posterior roots. (a) Spinal cord; (b) pia mater; (c) subarachnoid space; (d) arachnoid; (e) posterior roots, cellular infiltration and containing isolated swollen axis cylinders; (f) vessel with cellular infiltration and proliferated wall; (g) cellular exudate in subarachnoid space; (i) swollen axis cylinder. $\times 45$. (Ziegler.)

tubercles, sometimes with small yellow tuberculous nodules; frequently there is arteritis, which is sometimes obliterating.

In the most acute cases the brain substance immediately beneath the pia is intensely congested, slightly softened, and shows under the microscope a superficial encephalitis. The lateral ventricles are usually distended with clear serum, sometimes with

serum containing flocculi of lymph or pus; the amount present varies from one to four ounces in each ventricle, being always greater in the subacute cases. The walls of the ventricles may be softened. The distention of the ventricles leads to flattening of the convolutions from pressure against the skull, to bulging of the fontanel, and sometimes to separation of the sutures, if they are not completely ossified.

Tuberculous nodules varying in size from a small pea to a walnut are frequently seen associated with meningitis in older children, but not so often in infants. These nodules may be connected with the meninges, or they may be situated within the brain substance, usually in the cerebellum. The larger ones are classed as brain tumors. Inflammatory products are rarely found in the spinal canal.

Course.—The course of tuberculous meningitis is from three to ten days, although the symptoms may last from four to eight weeks, or even longer.

Child B. W., 5 years old. Father a physician and healthy. Mother healthy. Had just returned from the country in apparent good health. Was sent to school and seemed bright mentally and physically. Was a well-nourished child. Had had no previous illness excepting a disordered stomach. The first symptom of her present illness was headache. Had a coated tongue, loss of appetite and a slight rise of temperature, from 100° to 101° F. The temperature was very characteristic. (See chart.) The parents suspected a slight dyspeptic attack and gave her a laxative. Her diet was also corrected. In spite of cleansing the stomach and bowels, the headache persisted and reached such an acute stage that the child cried and moaned continuously, and did not sleep. When I first saw the case the symptoms of an acute gastric catarrh were so evident that nothing further was suspected. The headache persisted in spite of bromides. The child complained of ringing in the ears. Had twitchings of the arms and legs. The bowels assumed a normal color and consistency. An examination of the eyes with the ophthalmoscope was first made by H. Jarecky and later by Henry S. Oppenheimer, who found vision good, no choked disk—engorgement of veins only—slight reaction of pupils. No evidence of tuberculous disease was found. In the beginning of this illness the symptoms of headache were very prominent. The child appeared quite rational and the diagnosis of supra-orbital neuralgia was made. George W. Jacoby, who saw the case at my request, early in the disease believed that we were dealing with meningitis. Later on, however, the symptoms were positive. Abraham Jacobi, who saw this case later in consultation, diagnosed meningitis. At his suggestion leeches were applied and they afforded quite some relief. The headache reappeared with renewed vigor and remained incessant throughout the period of illness. Owing to the continued pain

PLATE LXVIII



Disseminated pulmonary tuberculosis in a two-year-old child having tuberculous meningitis. (Courtesy of *Wm. H. Stewart.*)

it was decided to relieve the intra-cranial pressure by lumbar puncture. I aspirated 45 cubic centimeters of clear spinal fluid which was sent to Billings, of the New York Health Department, for examination. He reported the presence of the tubercle bacillus and the diplococcus. B. Sachs confirmed the diagnosis of tuberculous meningitis.

Strabismus was also present. There was marked facial paralysis. Nausea and vomiting occurred. There were spasms and twitchings, also a hemiplegic paralysis. There was also a unilateral flush on the cheek and other well-marked evidences of vasomotor disturbances. The child was either soporose, in a semi-stupor, or crying and screaming with pain in the head. A distinct red streak remained when the skin was stroked with the finger nail, the so-called *tache cérébrale*. The Babinski reflex was also present. There was spastic rigidity of the entire body. The eyes were half open. Respiration was labored, at times—Cheyne-Stokes respiration. The pulse was small and compressible and varied between 80 and 160. The child died of extreme exhaustion and inanition, after suffering about ten days of terrible agony.

Symptoms and Diagnosis.—An irregular and intermitting pulse with Cheyne-Stokes respiration and slight elevation of temperature are amongst the early symptoms of this disease. The pupils show irregularity; not infrequently one pupil will be dilated, while the other may be a pin-point. Vomiting is an early symptom in many cases, and may continue in spite of rigid supervision of the diet, so that an organic lesion will be suspected. The vomiting is usually projectile in character. Later in the disease, the temperature ranges from 100° to 103° or even higher. The pulse may vary between 80 and 160 beats per minute. The respirations are increased and irregular in character, labored or sighing.

Tache Cérébrale.—The *tache cérébrale* is frequently present. This is produced by drawing the finger-nail quickly over the skin of the abdomen, arm, or leg, when a sharp, bright mark remains for several minutes.

Some symptoms come on very slowly. Intense headache is complained of and is usually supra-orbital in character. In the case referred to in this chapter the symptoms were masked for a number of days. The eyes usually show tubercles in the choroid. In the case reported here, although the eyes were examined by two competent oculists, no evidence of disease could be found. Strabismus as well as facial paralysis are frequently seen as evidence of paralysis. Twitchings are frequently noticed.

The Babinski reflex is very often present.

The child sleeps with its eyes half open. There is marked

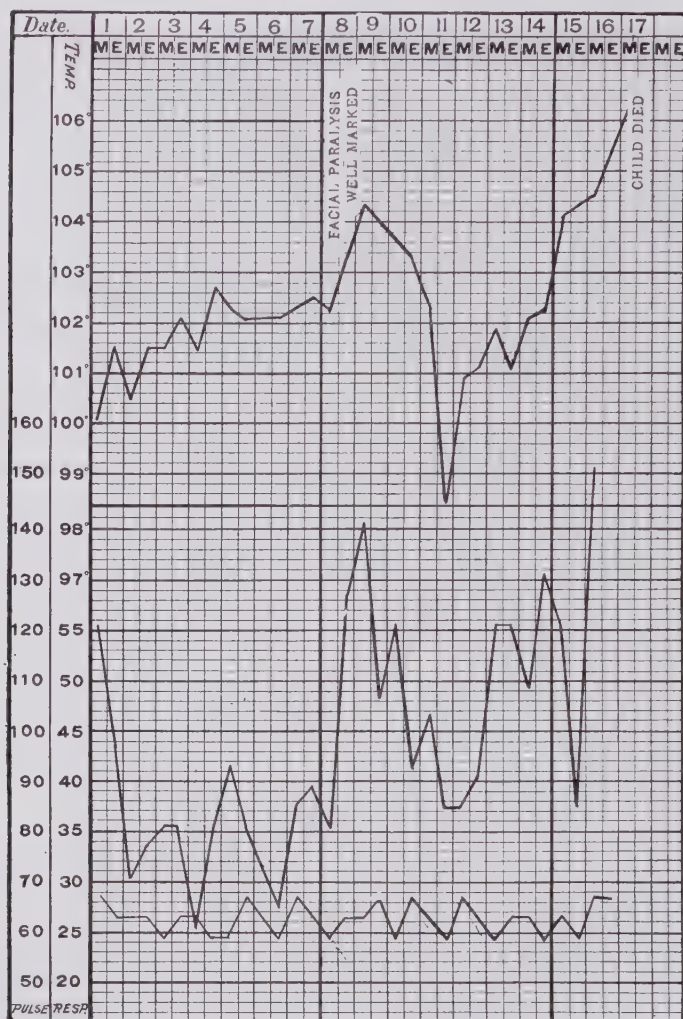


Fig. 254.—Case of tuberculous meningitis, well marked, ending fatally.

evidence of vasomotor disturbance, such as unilateral flushes, and spastic rigidity of the entire body is repeatedly seen.

Lumbar puncture will usually show a clear cerebrospinal fluid. In this fluid the tubercle bacilli can be located. In some cases

other pathogenic bacteria—for example, the streptococcus—can be found.

Inoculation of skin with tuberculin—von Pirquet test—is helpful in making the diagnosis.

The prognosis is bad. I do not know of a single case of distinct tuberculous meningitis that finally recovered.

Treatment.—Lumbar puncture should in all cases be performed. For details regarding technic of lumbar puncture see chapter on Epidemic Cerebrospinal Meningitis. Tapping the fourth or fifth ventricle will certainly relieve intra-cranial pressure. No more than 15 to 25 cubic centimeters should be withdrawn at one aspiration. I look upon this as a very valuable diagnostic as well as therapeutic measure. The head should be shaved, and an ice-bag or ice-coil applied continuously. Next in importance several leeches should be applied behind the ears, over the mastoid process of the temporal bone. Cerebral engorgement can also be relieved by applying leeches to the *ala nasi*; this will drain the blood through the frontal sinus. Rectal medication should be remembered.

Large doses (5 to 10 grains) of sodium bromide and sodium iodide should be given until quiet is insured. The bowels should be cleansed by a thorough irrigation with glycerine and water. Iodoform collodion (10 per cent.) can be applied to the scalp, thoroughly, once or twice.

Inunctions with mercurial ointment, at the nape of the neck, rubbed into the lymphatics, has been tried without benefit.

Peptonized milk, whey, soups, broths, zoolak, and buttermilk are indicated. Under no conditions should solid food be administered. If the child is in a coma, rectal feeding must be resorted to.

CEREBROSPINAL MENINGITIS (ACUTE MENINGITIS, SPOTTED FEVER, OR MALIGNANT PURPURIC FEVER).

Cerebrospinal meningitis is an acute infectious disease characterized by a sudden onset of symptoms.

Bacteriology and Etiology.—The presence of the diplococcus intracellularis of Weichselbaum is usually the causative agent of this disease. In a few cases, streptococci; in others, pneumococci have been found.

Weichselbaum states that he believes the meningococcus is frequently present and lies dormant in the crypts of the tonsils and pharynx. For this reason he believes that, when a lowered vitality exists due to subnormal conditions, then the meningococcus gains access through the lymph channels to the meninges and sets up an acute and sudden infection. In addition to the presence of the meningococcus in the tonsils, this pathogenic microbe is frequently found in the nose from whence it probably gains access through the frontal sinuses and reaches the brain. The meningococcus can be transmitted and an infection disseminated by direct contact with infected secretions containing the diplococcus intracellularis. Weichselbaum does not believe that the sudden appearance of a case of cerebrospinal meningitis, in an otherwise healthy locality, is extraordinary when the etiological conditions, such as the possibility of harboring this diplococcus in the nose and throat, are remembered.

Pathology.—In the early stage of this disease we note hyperemic conditions in the brain and spinal cord. When the disease has progressed, the arachnoid appears cloudy, especially along the course of the blood-vessels from which a purulent exudate oozes. This purulent exudate involves all the tissues of the convexity and frequently extends to the base in the meshes of the pia and between it and the cortex. The fluid in the ventricles is as a rule increased, and may contain small flocculi of fibrin. Hemorrhage is frequently noted in this region. The joints show evidences of septic inflammation. The spleen is frequently enlarged. Evidences of infection and sepsis are present in all parts of the intestinal organs of the body. Multiple abscesses may occur, and not infrequently parenchymatous degenerations involve the kidneys, liver, and spleen.

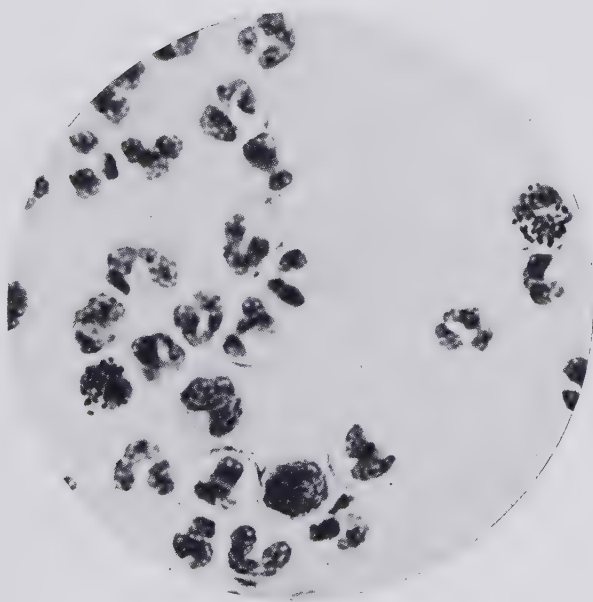
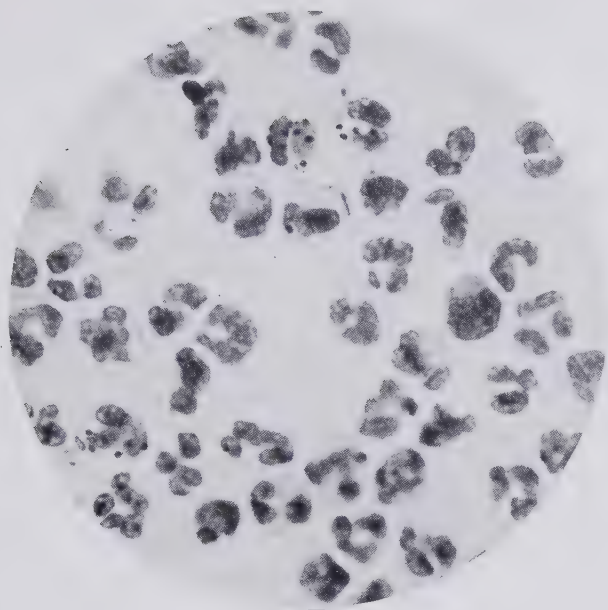
Purpuric spots or mottling, so frequently seen on the outside of the body, may sometimes be seen more distinctly in the internal organs.

Climatic Conditions.—The greatest number of cases occur during the winter months, while sporadic cases are seen in the spring, summer, and fall months.

Symptoms.—During the epidemic there were three classes of cases encountered: First, a mild type; second, a severe type; and third, an abortive type.

Abortive Type.—This type is usually seen in strong children who are able to withstand a severe infection. By reason of their

PLATE LXIX



Meningococci in pus-cells, spinal fluid. Characteristic intracellular arrangement.

TABLE No. 68.—DEATHS FROM CEREBROSPINAL MENINGITIS IN CHILDREN UNDER 15 YEARS. NEW YORK CITY—1902-1907.

| Year. | Old New York City. | Greater New York City. |
|-----------|--------------------|------------------------|
| 1902..... | 156 | 221 |
| 1903..... | 158 | 225 |
| 1904..... | 805 | 1056 |
| 1905..... | | 2775 |
| 1906..... | | 1032 |
| 1907..... | | 828 |

health they are infected in a lesser degree, as shown by their symptoms and the rapidity of their convalescence. The onset is usually sudden, and I have seen meningeal symptoms subside within ten days with no sequelæ. This happened in a case of a child with undoubted cerebrospinal meningitis, in which the diagnosis was confirmed by the bacteriological examination of the spinal fluid. Rhinitis with catarrhal discharge from the nose is sometimes an early symptom in this disease. Rhinitis is frequently found in the abortive type of the disease. The danger of having the meningococcus in the nose consists in the ease with which this pathogenic bacterium can enter the frontal sinus and thus give rise to encephalitis. In the abortive type of this disease there frequently is a nasal discharge in which the meningococcus intracellularis can be found long after the rhinitis has disappeared. The ambulatory cases are the ones which disseminate this infection because they carry the pathogenic bacteria from house to house.

Mild Type.—In this class of cases there is a slight rise of temperature, generally malaise, and perhaps vomiting.

Severe Type.—In the severe type there is a sudden onset of symptoms. In older children a distinct chill is usually the first symptom noted. The skin feels hot. The temperature rises anywhere between 102° and 105° F. (38.8° and 40.6° C.), in the rectum. The pulse varies; it may be slow or very rapid. The respiration is irregular in character, sometimes sighing, and labored, but most frequently Cheyne-Stokes in character. Later on there is vomiting, pain in the head, in the frontal or occipital

regions, and pain at the back of the neck. There is moaning and frequently delirium. Vasomotor disturbances, such as the flushing of one ear or one cheek, are occasionally seen. The *tache cérébrale* is usually noted when stroking the skin with the finger-nail, as a distinct hyperemia follows and remains for several minutes. The tendons are very sensitive to the slightest pressure. The patellar reflexes are usually absent. When the thigh is flexed on the abdomen and we try to extend the leg there is considerable latent contraction, the so-called Kernig sign. This symptom alone should not be depended upon. Hyperextension of the big toe produced by stroking the sole of the foot, the so-called Babinski reflex, is not always present. It is also frequently noted in perfectly healthy children. In a series of fifty children examined by me, the Babinski reflex was found in forty.

MacEwen's Sign.—MacEwen's sign can be elicited by percussion with the child in a sitting posture. The most resonant note is brought out by percussion toward the basal level of the frontal bones and the squamous portion of the parietal bone. MacEwen's sign is elicited in acute cerebrospinal meningitis. It is not present under normal conditions. It should not be depended upon solely but as an aid to the diagnosis.

Brudzinski's neck sign in tuberculous and other types of meningitis is present in 100 per cent. of those ill with either cerebrospinal meningitis, serous or pneumococcus meningitis.

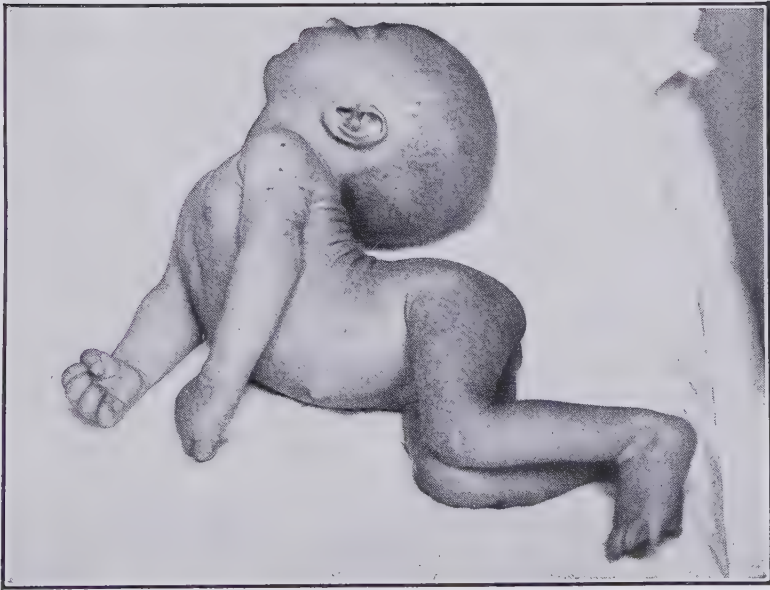
Technic.—The head is forcibly flexed with the left hand while the child is lying flat on its back; with the right hand, pressure is exerted on the chest to keep the child from being lifted. If the sign is positive, both legs will flex on the thighs and the thighs on the abdomen.

The identical collateral sign consists in flexing the leg on the thigh and the thigh on the abdomen, when the opposite lower member will assume the same position.

The normal cytology of the cerebrospinal fluid varies from 0 to about 7 lymphocytes per cubic millimeter. In any meningeal irritation, acute or chronic, the lymphocytes increase in number. They may be increased indefinitely up to thousands.

In a number of cerebrospinal fluids from infants, examined by Kaplan, he found that in the tuberculous forms the lymphocytes predominate. In the other acute meningitides of children the polynuclears and lymphocytes claim about equal or nearly equal relations. It is marvelous how readily the polynuclears diminish

PLATE LXX



Cerebrospinal meningitis. Autopsy showed a yellowish-green, mucopurulent exudate, cheesy in character, covering the anterior two-thirds of the cerebrum. The fluid obtained by lumbar puncture as well as that by intraventricular aspiration showed a pure influenza bacillus. The autopsy was performed by John Larkin. The fluid examined by Kaplan and Sophian.

if the case shows the slightest tendency to improve, and *vice versâ*, they increase as the inflammatory process grows worse. *Pari passu* with the polynuclear increase the Fehling reaction disappears. This point is extremely important, as there are a number of cases of tuberculous meningitis where the tubercle bacillus cannot be found even if the antiformin or the Jousset method is used. In these instances I consider the copper-reducing substance in the cerebrospinal fluid as highly suggestive of the tuberculous nature of the meningitis. The non-reduction of the Fehling solution or the appearance of a violet color change instead, in Kaplan's opinion, is significant of the non-tuberculous nature of the affection unless a mixed infection is at hand. In case a double infection is demonstrated microscopically, the invader that has the upper hand in the infection usually reflects upon the behavior of the cerebrospinal fluid with the Fehling solution. If it is the tubercle bacillus it will reduce; if it is another organism it will not. The latter phenomenon is due to the fact that it produces a marked increase in the polynuclears, which in some way are responsible for the non-reduction.

Either constipation or diarrhea may be present. The bladder acts well, although enuresis may exist. In some cases there is a marked retention of urine. The joints are usually swollen, simulating rheumatism. There is also a distinct petechial eruption in some cases. Out of a series of twenty-two cases seen by me, six had distinct petechia. In six others the skin had a distinct eruption resembling scarlet fever. Owing to the spots present in this condition, the disease was frequently termed "spotted fever." The pupils are usually dilated; they are sometimes irregular. I have seen cases during the epidemic of 1905 in which one pupil showed marked dilatation, while the other pupil was contracted to almost a pinpoint. Strabismus is a frequent symptom. Occasionally we note nystagmus. Photophobia is a frequent symptom. In one of my cases the child cried whenever a lighted candle was brought near the eyes. Opisthotonos is usually present. The severe rigidity of the sterno-cleido-mastoid muscle in addition to the marked rigidity of the arms and legs forms a very prominent symptom during the course of the disease. Owing to these severe contractures we usually note constant moaning, most likely induced by the pain caused by the said contractures. Although tuberculous and cerebrospinal meningitis may coexist, this condition is rarely found.

Diagnosis.—A positive diagnosis of this disease can be made by examining the fluid drawn by lumbar puncture. As a rule the spinal fluid is turbid or opaque. An occasional spinal fluid may be clear and transparent, as it is seen in tuberculous meningitis. The presence of the characteristic diplococcus intracellularis described by Weichselbaum is usually noted. In rare cases the streptococcus and the pneumococcus have been found, but these latter are the exception. The bacteriological diagnosis, according to Weichselbaum, depends on the diplococcus being Gram negative, or decolorized by Gram. It is important to remember that the *Micrococcus catarrhalis* is frequently found in the nasal passage; hence, great care must be exercised to differentiate the same, both in its relation to Gram staining and also in its morphological characters.

The following two cases will serve to illustrate the method of treatment:—

Case I.—Emilio G., four months old, was admitted to the Sydenham Hospital. Family history negative.

Personal History.—Normal delivery. Full term. Bottle-fed since birth.

Present illness began two weeks ago with twitchings of the muscles. One week ago mother noticed retraction of the head. There had been no vomiting. The baby had moaned almost constantly.

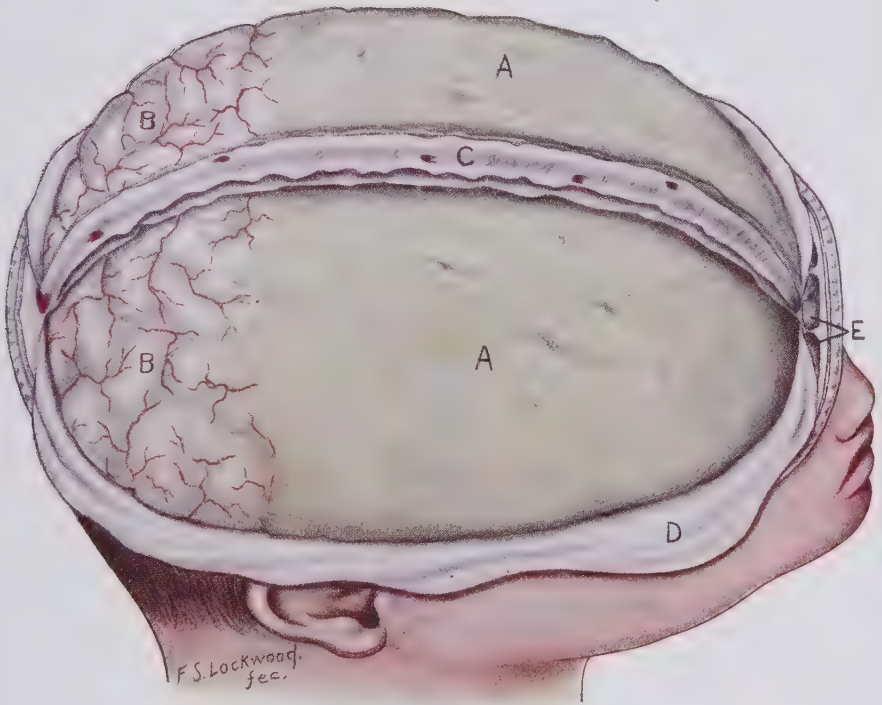
Physical Examination.—Head showed bald occiput. The anterior fontanel was open and slightly bulging. The pupils were equal and slightly contracted. There was marked retraction of the head, amounting to opisthotonos. The chest showed poor expansion. There was a systolic murmur heard at the apex of the heart. The lungs over left base posteriorly, showed small areas of dullness, bronchial voice, and breathing. The abdomen was retracted. The liver and spleen were not palpable. There was marked rigidity of both arms and legs. The reflexes were exaggerated. Kernig's sign was not elicited. Lumbar puncture showed turbid fluid in which the *Diplococcus intracellularis* was found.

The duration of the disease was thirty-six days. By means of ten lumbar punctures, I aspirated 146 cubic centimeters spinal fluid, and in nine intraspinal injections, I injected 245 cubic centimeters Flexner serum. The average injection was about 30 cubic centimeters. The child made a complete recovery without any sequelæ.

CASE II.—*Intraventricular Method of Serum Injection.*—Dora R.,¹ two months old, was admitted to the Babies' Ward of the Sydenham Hospital,

¹This case was presented at the Section on Pediatrics, New York Academy of Medicine, March 10, 1910. Discussion opened by Simon Flexner.

PLATE LXXI



Cerebrospinal meningitis due to the influenza bacillus. *A,A.* Anterior cerebrum covered with a thick muco-purulent exudate. *B,B.* Normal cerebrum. *C.* Superior longitudinal sinus. *D.* Reflected integuments. *E.* Frontal sinus. This infection has been seen by me in an infant 4 months old. The infection probably enters through the lymph channels in the nasopharynx, thus reaching the base of the brain. The bacillus may also have entered through the frontal sinus. In the spinal fluid as well as in the ventricular fluid a pure culture of the influenza bacillus was found. The infant died of convulsions. The autopsy performed by John Larkin showed the anterior two-thirds of the cerebrum was covered with a thick, muco-purulent, greenish exudate, cheesy in character. The convolutions of the cerebrum were obliterated and covered by a thick exudate, the surface of which was marked by many whitish nodules and a number of pits near the falx cerebri. At the frontal lobe of brain on right side a dark, necrotic area was seen. Illustration shows the calvarium removed, the dura mater incised longitudinally on either side of the superior longitudinal sinuses and reflected laterally, exposing the entire cerebrum.

October 2, she was a well nourished, breast-fed infant, having had no previous illness. There was a sudden onset with vomiting, loss of appetite, rigidity of head, neck, and extremities, rolling of the eyeballs, insomnia, and convulsive movements. The anterior fontanel was open one-half inch in diameter, and slightly bulging. The posterior fontanel was almost closed. The pupils were equal, and reacted sluggishly to accommodation and light.

The thorax, ears, and throat were excluded as a possible source of disease.

On the fifth day after admission, and on two succeeding days, lumbar puncture was performed resulting in dry tap. With the three successive dry taps, the symptoms of rigidity, opisthotonus, fever, and twitching increased.

On October 20th, I decided to tap the lateral ventricles by entering the anterior fontanel at the right angle¹. The aspiration needle, about 8 centimeters in length, was introduced downward and towards the median line, at an angle of about 20 degrees, to a depth of about 4.5 centimeters, the needle entering the lateral ventricles near the median line. About 15 cubic centimeters of turbid purulent fluid were withdrawn, which was identified at the Rockefeller Institute as a meningococcus intracellularis. The ventricles were then irrigated with normal saline solution, at body temperature. The excess fluid was allowed to drain out through the needle, and 25 cubic centimeters of Flexner anti-meningitis serum were slowly injected into the ventricles. During the injection of the serum the infant changed in color from a waxy pallor to a uniform red flush all over the body. One-half hour after the injection of the serum the infant still remained flushed, perspired profusely, and had some frothing at the mouth. Otherwise the general condition was good. The temperature was 98° F.; respiration, 80, and pulse, 120.

On October 21st, the ventricles were again irrigated with 40 cubic centimeters of normal saline solution, and 20 cubic centimeters of serum were injected.

October 24th, the child's general condition was very poor. Opisthotonos was marked. The body rigidly bent in the form of a bow. The arms were rigidly extended and the palms everted outward.

October 25th, and during the following week, daily injections of 30-50 cubic centimeters of serum were injected either into the ventricles or, on two days, into the spinal canal and lateral ventricles. The total amount of Flexner serum injected was 180 cubic centimeters; the total amount retained in the ventricles and spinal canal was about 100 cubic centimeters.

The symptoms gradually subsided, the rigidity became lessened, but on being handled opisthotonus was still evident.

November 29th. No decided change, but infant improved slowly. The lateral ventricles were aspirated and 50 cubic centimeters of clear fluid which did not contain the meningococcus were withdrawn.

¹ See Plate LXXII.

December 6th. No complication of eyes and ears existed. The child made a complete recovery.

Two months after the infant was discharged, the mother reported she has developed a tooth, sleeps well, nurses well, and is a happy healthy infant.

Lumbar Puncture.¹—The subarachnoid space is frequently tapped for diagnostic and therapeutic purposes. Either space between the third and fourth, or the fourth and fifth, lumbar

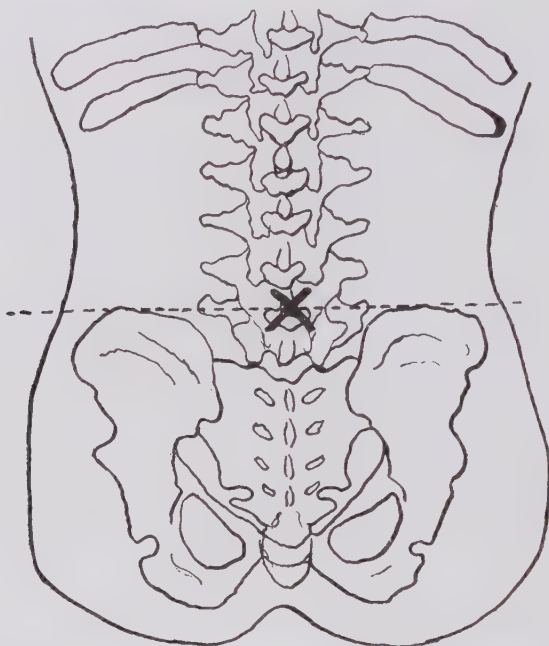


Fig. 255.—Anatomical illustration showing the place best adapted for lumbar puncture. The needle should be inserted in the lumbar space shown by the cross.

vertebræ may be chosen. The child is placed on either side with the spinal curve toward the operator, in this way spreading the vertebræ so that the greater angle formed by the vertebræ is toward the operator. An imaginary line drawn through the crest of the ilium to the spine is an easy means of locating the place to puncture.

Kind of Needle Required.—In making a lumbar puncture we should use such a needle as would be required in making a

¹ First described by Quincke.

puncture for empyema. The needle should be pushed a little upward and forward until it enters the spinal canal, then the stylet should be withdrawn. If the fluid does not escape through the needle, then withdraw it slightly and reintroduce the stylet to dislodge any obstruction in the caliber of the needle. Make the puncture as simple as possible rather than lacerate the tissue around the vertebral column and cause bleeding by lateral movements of the needle.

Amount of Fluid to be Withdrawn.—For diagnostic purposes 15 to 20 cubic centimeters should be withdrawn, if the fluid is watery and clear. If the spinal fluid is turbid, then the more we can withdraw, the better. I have withdrawn as much as 50 to 60 cubic centimeters. If the diplococcus intracellularis is found in the spinal fluid, it is especially important to withdraw as much of the fluid as possible.



Fig. 256.—Lumbar puncture needle.

The site of puncture should be closed with a strip of adhesive plaster.

Local Anesthesia.—Ethyl chloride in the form of a spray is useful in very sensitive children. It is not necessary to have a general anesthesia during this procedure. General rules of asepsis must be strictly applied to the child's skin, the operator's hands, and to the needle used.

Dry Tap in Lumbar Puncture.—We may have a dry tap:—

1. If the caliber of the needle is small, and the spinal fluid very thick.
2. If adhesions are present at the base of the brain, preventing the passage of fluid from the ventricles to the subarachnoid space.
3. If a successful puncture has been made, a dry tap may follow, due to inflammatory adhesions caused by the previous introduction of the needle.

4. The closing of the foramen of Magendie is the most frequent result of the inflammatory process, resulting in dry tap.

5. A fibrin clot or the presence of the cord in front of the needle may prevent the outflow of the cerebrospinal fluid.

To be sure that we are in the spinal canal, if a dry tap exists, leave the needle *in situ* and introduce a second needle two spaces

lower. Sterile water if injected through the upper needle will flow out of the lower needle, proving that we are in the spinal canal.

The spinal cord in infants terminates about the level of the lumbar vertebræ. The introduction of the needle is simplest between the third and fourth, or the fourth and fifth, lumbar vertebræ. In these interspaces there is no cord; hence no injury can follow. An imaginary line drawn through the crest of the ilium corresponds to the fourth intercostal space.

Prognosis and Sequelæ.—Heretofore the prognosis was always bad; since the introduction of the Flexner serum a decided improvement has been noted. Where formerly 70 to 80 cases died and only 20 to 30 cases recovered, we now have the reverse, 70 to 80 recoveries and only 20 to 30 deaths. The prognosis is better if the serum treatment is given early in the disease.

The duration of this disease may be short or very long. Young infants have been attended by me more than two months before recovery took place. Some cases after serum treatment recover entirely; others have atrophy of the optic nerve resulting in blindness. Deafness is a frequent and permanent injury in some cases.

Treatment.—Antipyretic measures such as cold packs, ice bag on the head, and tub baths are indicated. The coal-tar products, owing to their depressing effect upon the heart, should be avoided. Lumbar puncture should be performed.

When high fever exists, flushing the rectum and colon with a cold soap-suds enema will be found useful.

To relieve the vomiting cracked ice should be given, in addition to 1-grain doses of menthol. To relieve muscular spasm, twitching, and delirium, hyoscine hydrobromate, in doses of $\frac{1}{600}$ to $\frac{1}{300}$ grain, should be given and repeated every few hours. Morphine hypodermically, in doses of $\frac{1}{50}$ grain, gradually increased, is also valuable. Sodium bromide, in 5- to 30-grain doses, may be given until the systemic effect is noted. Codeine, $\frac{1}{40}$ grain gradually increased until $\frac{1}{2}$ grain is given, will frequently soothe the nervous system. The soothing effect of a warm bath is generally recognized. The bath should be given at a temperature of 100° to 105° F. in a bathtub of water to which $\frac{1}{4}$ to $\frac{1}{2}$ pound of sulphur has been added. A warm sulphur bath may be given twice a day. The duration of each bath should be at least ten to thirty minutes.

*Meningitis Serum.*¹—The specific value of the anti-meningitis serum has been noted many times. In some cases reported there has been a sudden crisis and an amelioration of all the symptoms. My experience has been especially good in infants under one year. While formerly the mortality was 100 per cent., we now have a number of cases reported, including my own, in which recovery has taken place.

Intraspinal Injections.—After lumbar puncture we inject, through the same needle left *in situ* from 30 to 60 cubic centim-

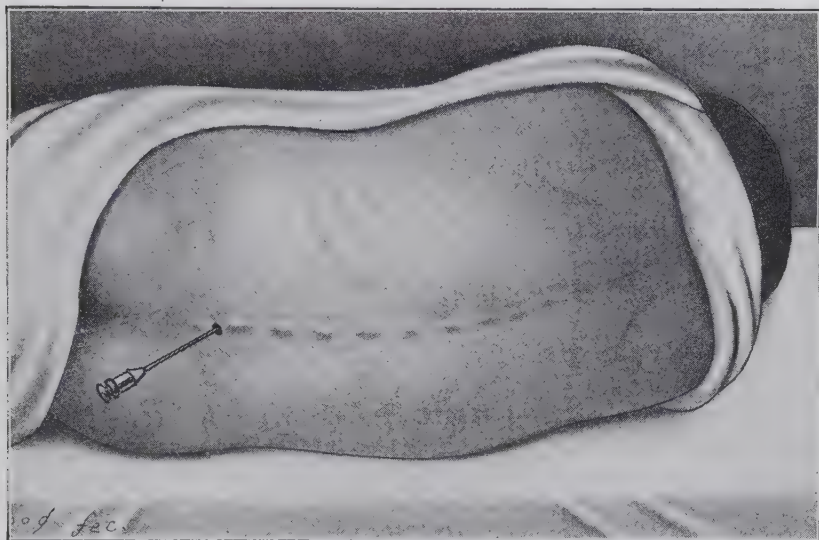


Fig. 257.—Lumbar puncture made between fourth and fifth lumbar vertebrae.

eters of Flexner's serum, by the gravity method. The serum should be warmed before injecting, and should be injected slowly. It is better to elevate the hips and lower the head when injecting the serum. Daily injections of 30 to 60 cubic centimeters are required if no improvement is noted.

Before serum is injected, a lumbar puncture should be made and as much fluid drained as possible. This draining should continue until no more than four drops escape per minute. A sterile syringe filled with 30 to 60 cubic centimeters of serum previously warmed, should be in readiness.

¹ I am indebted to Simon Flexner, of the Rockefeller Institute, for the anti-meningitis serum used in these cases.

The needle remains in place. The syringe, after the air is expelled, is connected with the needle. The serum should be injected slowly and the patient carefully watched—the respiration, pulse, and color of the skin noted. When pressure in the dura is evident there may occur stertorous respiration, failing pulse and cyanosis. When such symptoms appear the syringe should be disconnected, and the serum allowed to flow out until such symptoms have disappeared. After the injection of serum it is always a safe measure to leave the needle in the canal for three or four minutes, or until all danger of pressure symptoms have passed.

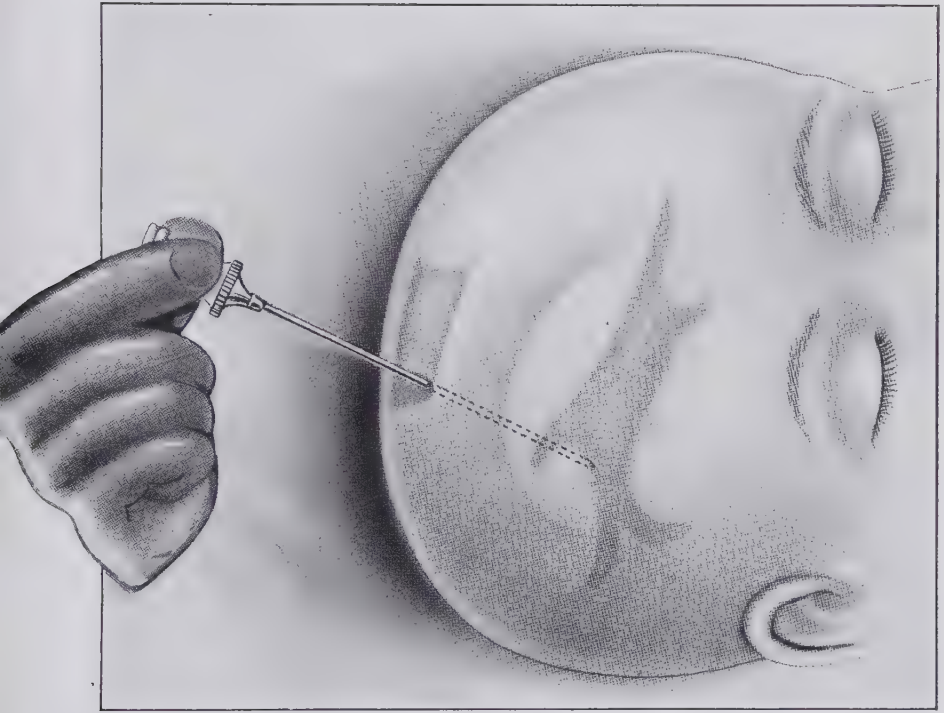
*Ventricular Aspiration and Intracranial Injections.*¹—The scalp should be shaved and prepared with the usual aseptic precautions. The aspirating needle must be rendered sterile by boiling. It is then pushed through the anterior fontanel downward and inward into the ventricles of the brain, at least one inch or more. The needle is inserted about one-fourth inch to one side of the longitudinal sinus.

Kocher advocates puncturing through the frontal lobe at a point $2\frac{1}{2}$ centimeters from the middle line and 3 centimeters anterior to the central fissure—a point lying somewhat in front of the bregma. The needle must penetrate 4 or 5 centimeters before it reaches the ventricles and should be directed somewhat downward and backward.

The ventricles at this situation are broad, extending fully 2 centimeters from the middle line, and there is practically no risk of hemorrhage during the passage of the needle. With experience and after practice on the cadaver, punctures may be safely made, not only at the point of Keen and Kocher, but elsewhere if need be—through the anterior pole of the frontal lobe, through the pole of the occipital lobe, etc.; but these methods are more hazardous than those detailed above, and should only be undertaken by operators who are particularly familiar with intracranial work. In infected cases with a beginning external meningitis, there is always a certain risk of inoculating an uninfected ventricle. The same accident has occurred owing to the passage of an occluded needle through an abscess and then into the ventricle. A trochar should not be used. It is advisable to

¹ I am indebted to my house staff, Bobrow, Clurman, Littenberg, and Freund, for careful notes and records of a series of cerebrospinal meningitis cases treated at the hospital. See clinical case, page 942.

PLATE LXXII



Translucent head of child. The needle entering the outer angle of the anterior fontanelle, and penetrating the lateral ventricle, which is seen in shaded outline. The falx is dimly seen. The light line running from before backwards is the septum lucidum dividing the two ventricles.

employ a needle with a sharply blunt point, which will pass by vessels without cutting them. The opening in the needle should be on the side and not upon the point; else they become plugged by the brain matter.

At the Babies' Wards of the Sydenham Hospital we have aspirated, many times, 50 cubic centimeters of purulent liquid containing the diplococcus intracellularis in almost a pure culture. By using this same needle, or one having a larger caliber, we irrigated, using a pint of normal saline solution. After draining off as much as possible, 50 cubic centimeters of Flexner's serum were injected. This plan of treatment was successfully used in two of my cases. In both cases the lumbar puncture yielded a dry tap.

The purulent discharge gradually lessened and the meningococci gradually disappeared after continued serum injections extending over a period of four weeks. It was possible to aspirate and draw off between 50 and 60 cubic centimeters of a clear, transparent hydrocephalic fluid containing no germs.

A decided reaction followed each and every injection of serum. During the injection of serum, the child changed in color from a waxy pallor to a uniform red flush all over the body. One-half hour after the injection of the serum, the child still remained flushed and perspired profusely, and had some frothy mucus at the mouth.

The pulse-rate was increased, the volume improved, and the tension much higher. The leucocytes were invariably increased. The polynuclear leucocytes were also increased after each injection. As a rule the mononuclear leucocytes and the lymphocytes were reduced within six hours after the serum injection.

In the treatment of the severe type of cerebrospinal meningitis, we must persist even though convulsions recur. We must afford relief by draining the ventricles of as much of the cerebrospinal fluid as possible. This must be followed up by an intraspinal injection of sufficient antimeningitis serum, as previously mentioned in this article. One of my cases recovered, although the prognosis was absolutely fatal, by the persistence of the above-outlined treatment.

Feeding.—Unless the strength is supported by food our patient will die of exhaustion. Feeding by mouth with peptonized milk, broth, gruel, and eggs is indicated. If, however, there is vomiting and the stomach does not retain food, then

rectal feeding should be resorted to at intervals of three or four hours. This method of feeding has already been described in the chapter on Infant Feeding.

After Treatment.—If the case progresses favorably, careful attention must be given to restorative treatment. Codliver-oil, Fowler's solution, and iodide of sodium are indicated. Massage and sea-salt bathing are indicated during convalescence. A decided change of air from the city to the sea-shore or to the mountains will prove beneficial.

ENCEPHALITIS LETHARGICA (SLEEPING SICKNESS).

This condition usually follows an acute influenzal infection. Since the severe epidemic of 1917 and 1918 many cases have been reported showing an etiological relationship between the two diseases.

*Relation to Poliomyelitis.*¹—Its relation to anterior poliomyelitis is not easy to prove or disprove. They both seem to be systemic diseases, the virus of which is probably lymph borne and has a special affinity for the motor element of the central nervous system.

The geographical distribution of the epidemic of encephalitis has been far more widespread than that of any epidemic of poliomyelitis, but it has not been so severe in any one small area.

The method of transmission of epidemic encephalitis and poliomyelitis is absolutely obscure. There is growing opinion that direct contagion is not the mode of transmission of poliomyelitis, and there seems to be no evidence of contagion in the spread of epidemic encephalitis. Both French and British authors have observed that two cases have never developed in the same house. It seems not unlikely, however, that the virus producing both of these diseases is similar, but of different strain.

Epidemic encephalitis presents certain differences from poliomyelitis which cannot be overlooked:

It affects all ages, but more especially young adults.

The palsies are usually less profound, may be variable and have more of a tendency to clear up.

The localization is in the brain and brain stem rather than in the cord.

¹ TILNEY AND HOWE: Monograph on Epidemic Encephalitis, Hoeber, 1920.

The pathological changes are less severe; there is less evidence of meningeal inflammation; more of a tendency to hemorrhage; less severe inflammatory and degenerative changes in the nerve cells, and less marked neuronophagy.

Possibly the greatest difference between the two conditions is in the nature of the action of the virus on the nerve elements. In poliomyelitis there is a sudden, sharp attack which develops rapidly and in a few days attains the maximum of severity, quickly producing the greatest extent of destruction. In epidemic encephalitis the onset is frequently very gradual and the progress of the disease slow, in some instances requiring several months to reach its greatest severity, and even then the findings have a tendency to variability, being subject to exacerbations and remissions.

Etiology and Pathology.—It is most likely an air-born infectious disease, and also probably contagious. The pathological condition involves any part of the brain likewise the pia. The basal ganglia show the most marked changes and the floor of the fourth ventricle also shows severe inflammatory involvement. In an autopsy reported by Henry L. Winter the pia was found much reddened over its entire surface, and contained minute grayish granules suggesting small tuberculous studs. Evidences of hemorrhage existed throughout the pia, also extending into the surrounding tissues.

Symptoms.—There is a sudden onset of symptoms in which a semi-comatose condition predominates. The children sleep continuously, hence the term "sleeping sickness." They can be aroused for food and will give intelligent answers. When they have a deeper sleep, and can be aroused with difficulty, the prognosis is very bad.

In older children an early symptom is double vision. A second symptom loss of consciousness although the patient can be aroused and give rational answers.

Occasionally cataleptic posterior poliomyelitic types or epileptic types are reported but such cases are rare. A ptosis of the eyelid is very common. A rise in temperature varying between 99° F. and 105° F. is reached. The pulse is irregular, frequently intermittent due to disturbed innervation through cranial nerve irritation. The respirations are usually altered, either very slow or markedly accelerated. The Cheyne-Stokes type was not observed by me.

In a series of five cases reported by Winter of Cornwall, the blood-pressure was persistently low. The spinal fluid was obtained under slight pressure.

Diagnosis.—Continuous sleeping or a comatose condition is the characteristic feature of the disease. Some children are in a semi-coma and can be aroused. The diagnosis cannot be made by examination of the spinal fluid. In a case of this kind seen by me in June, 1921, the spinal fluid showed 32 cells per cubic centimeter. On culture it was negative as to organisms. The Fehling reaction was + + +. An occasional mononuclear cell was found. The Wassermann was negative. Two days later the child appeared brighter, opened its eyes, and a second lumbar puncture was made, which showed 20 cells per cubic centimeter albumin and globulin + Fehling-normal. The child recovered after three weeks.

The following case is of interest:

M. Z., 3 years old, was examined by me in June, 1921. Had been ill four days. The temperature reached 104.4° F. and remained high two days. The attack resembled an acute gastric infection. There was vomiting, the pulse was irregular and intermittent, the eyes rolled and delirium persisted for two days. The child then sank into a comatose condition.

The patellar reflexes were exaggerated. Babinski-present. Kernig-absent, rigidity of the neck absent. Brudzinski-absent. Tâche-present. The pupils responded, the left dilated, the right smaller and contracted. There was loss of motion in right leg and right arm. No bulbar symptoms nor dysphagia were present. There was paralysis of the sphincter ani, consequent prolapse. The coma lasted seventeen days. On the twenty-second day effort was made to move the arm and leg. Motion gradually returned. The child made a complete recovery.

An increased cell count was not noted. The spinal fluid shows an absence of bacteria. Ophthalmoscopic findings were usually negative excepting a descending optic neuritis described by von Graef as an extension from meningeal changes at the base.

The duration of the disease varies from eight days to eight weeks or longer.

Treatment.—Owing to the low blood-pressure active catharsis is contraindicated. If constipation exists a soap water enema is indicated.

Nutrition.—Milk, gruels, or yolk of egg added to broth is easily metabolized. Urotropine has been advised but I cannot support the theory of its use. Digitalis is an excellent drug to support

and correct an irregular heart. Depressing drugs such as veronal and the bromides have been advised. Better results were noted with warm baths than with sedatives. These warm baths stimulate diuresis, promote diaphoresis and exert a soothing effect on the central nervous system, promoting sleep. These hot baths may be repeated morning and evening without the depressing effect usually associated with sedatives.

The outcome of the case depends on the assimilation of concentrated nutrition and on its elimination through the emunctories.

Water should be frequently given, and if the lethargic symptoms are very pronounced the instillation of food by means of gavage or rectal enemata should be remembered. Such feeding can be carried out at least three times a day.

The instillation of 5 per cent. dextrose solution using 4 ounces in the colon three times a day will prevent acidosis. To avoid acidosis due to carbohydrate starvation, rice or barley with milk should be given. When this is impossible due to the lethargic condition rectal feeding should be ordered (see chapter on Rectal Feeding). The outcome of any case of this kind depends on the amount of nutrition assimilated.

ACUTE PACHYMEINGITIS (INFLAMMATION OF THE DURA MATER).

This condition frequently follows middle-ear disease, although it may be the result of injury to the cranium. It is frequently associated with inflammation of the pia mater (leptomeningitis). It is very difficult to diagnose. It usually follows ear disease and the symptoms of meningitis are associated. The treatment is surgical.

CHRONIC PACHYMEINGITIS.

Chronic pachymeningitis can be divided into two forms—hemorrhagic and non-hemorrhagic. There may be punctate hemorrhages or there may be very large hemorrhagic areas. Some authors state that this condition is very rare. It affects the inner layer of the dura mater. It is frequently called pseudomembranous and hemorrhagic, or hematoma of the dura mater.

In cases where life is prolonged for years, there may be partial or even complete absorption of the clot, followed by the forma-

tion of cysts, considerable inflammatory thickening of the pia with deposits of blood pigment, and finally atrophy and sclerosis of the cortex. The source of the hemorrhage may be the rupture of a single large vessel, but more frequently the blood comes from many small vessels.

Symptoms and Diagnosis.—It is very difficult to give positive symptoms by which this condition can be recognized during life. Coma, convulsions, stupor, and vomiting are the main symptoms. Unilateral hemorrhage causes rigidity affecting one arm and leg, but if the hemorrhage is diffused all the extremities are affected. The pupils may be dilated or contracted; sometimes one pupil is dilated and the other is contracted. The respiration and pulse are slow and irregular. There is usually fever, the temperature being as high as 105° or as low as 100° F.

Opisthotonos may be absent. The patellar reflex is usually exaggerated. Convulsions appear and death ends the scene.

The differential diagnosis, according to Holt, is as follows: Without large hemorrhages, pachymeningitis interna cannot be diagnosticated; and it is impossible to differentiate the hemorrhagic cases from other varieties of meningeal hemorrhage. It is important to make a diagnosis between pachymeningitis with hemorrhage, and acute simple meningitis. In the former we have a sudden onset; stupor occurring early, usually on the first day, gradually diminishing in cases of recovery, or deepening into coma in fatal cases; localized or general paralysis, also occurring early; there is no fever in the beginning, and only moderate fever at the close. In acute meningitis we usually have a higher temperature, especially early in the disease; coma develops later, and rigidity of the extremities is less pronounced. In certain cases, however, where the hemorrhage occurs in the course of some other disease, a differential diagnosis may be impossible.

The prognosis is usually fatal. If small hemorrhages take place, the paralysis may remain for years.

Treatment.—The scalp should be shaved and an ice-bag applied. Leeches should be applied to the mastoid to relieve cerebral congestion. Large doses of bromide and ergot will sometimes do good. The emunctories must be carefully watched and aided if necessary.

CEREBRAL PARALYSIS (SPASTIC DIPLEGIA, PARAPLEGIA, HEMIPLEGIA).

There are two forms of palsy usually seen. When the face, arm, or leg is palsied it is called monoplegia. When the two lower extremities are affected, paraplegia. When one side is affected, hemiplegia. When both sides are affected, diplegia.

They occur in one of three periods: first, during intra-uterine life (prenatal); second, traumatism during labor; third, palsies after birth of the child.

Etiology.—Injury to the mother frequently injures the cerebrum of the fetus. Toxic conditions, especially those associated with the infectious disease resulting in muscular degeneration, frequently cause palsy. Compression of the infantile brain and its circulation during a slow labor may produce thrombosis or meningeal hemorrhage. This condition is most liable to occur in a primipara. Whooping-cough has caused cerebral hemorrhage and injury and compression to the cortex ending in paralysis.

Syphilis may be a frequent cause of this condition. Epilepsy is found in over two-thirds of all cases as a sequela.

Pathology.—Very interesting data are contributed by Peterson and Sachs, to whom I am indebted for the following classification:—

A summary of the pathological lesions resulting from acute apoplexies consists of atrophies, sclerosis, and other changes due to hemorrhage; also, embolism and thrombosis.

Fatty degeneration of the blood-vessels is the probable explanation of the escape of blood in a large number of cases. Heart lesions, pneumonia, and other infectious diseases predispose to embolism.

The secondary changes result in sclerosis or areas of softening. The sclerosis is largely responsible for the imbecility and epilepsy; transverse fibers connecting intimately all parts of the hemispheres.

Spencer studied 130 cases of still-born children. He found 53 cases due to hemorrhage from the pia and arachnoid. In 29 cases there was bilateral hemorrhage, 10 in the left side only; 10 in the right side; 7 in the lateral ventricles; 6 at the base of the brain; 1 case of intra-cerebral hemorrhage; 4 cases of thrombosis of the longitudinal sinus.

TABLE No. 69.

| Groups. | Pathological Changes. |
|---------------------------------------|--|
| I. Paralyzes of intrauterine onset. | LARGE CEREBRAL DEFECTS (true porencephaly). HEMORRHAGES OF INTRA-UTERINE origin (softening?). AGENESIS CORTICALIS. |
| II. Paralyzes occurring during labor. | MENINGEAL HEMORRHAGE (very seldom intracerebral). Resulting conditions: meningo-encephalitis chronica; sclerosis; cysts; atrophies (porencephalies). |
| III. Paralyzes acquired after birth. | MENINGEAL HEMORRHAGE (very seldom intracerebral); EMBOLISM; THROMBOSIS (in marantic conditions and occasionally from syphilitic endarteritis). Results of these vascular lesions; cysts; softening; atrophy; sclerosis (diffuse and lobar). CHRONIC MENINGITIS. HYDROCEPHALUS (seldom the sole cause). PRIMARY ENCEPHALITIS (Strümpell). |

Symptoms and Diagnosis.—The following symptoms are common to all forms of palsy: Rigidity of the muscles, contraction of tendons, and exaggeration of all the deep reflexes. Convulsions and coma commonly precede the diseased state. Most cases of diplegia and paraplegia are congenital, while most cases of hemiplegia are acquired after birth.

Palsies usually follow a difficult labor. Strabismus and facial paralysis are frequently noticed. Aphasia may be present in children that had previously learned to talk. The reflexes on the affected side, knee and elbow, are usually exaggerated (Peterson, Taylor, and Wells).

When athetosis is found, it is usually associated with imbecility and idiocy.

In associated movements the exact imitation of the paralyzed hand and fingers of voluntary movements made by the normal hand and fingers takes place. Choreiform movements, called by Weir

Mitchell post-paralytic chorea, are frequently mistaken for chorea. Peterson¹ describes two congenital hemiplegias—a hitherto unnoted morbid movement to which he has given the name *post-hemiplegic polymyoclonus*. The movements are neither choreiform nor athetoid, but are constant clonic contractions of most of the muscles in the limbs affected, not occurring synchronously, and the rhythm being about that of paralysis agitans



Fig. 258.—Infantile cerebral paralysis. (Kindness of A. C. Cotton.)

(five per second). All of these movements indicate interference with motor conduction due to lesions in some part of the voluntary and inhibitory tracts.

The following schedule of symptoms by Jacobi is useful in showing the diagnostic features of the different palsies:—

Upper Extremity.—Deltoid: Absence of deformity, which is averted by weight of arm. Inability to raise arm. Sometimes

¹ STARR: American Text-book Diseases of Children.

subluxation. Frequent association with paralysis of biceps, brachialis anticus, and supinator longus.

Lower Extremity.—Ilio-psoas: Rare except with total paralysis. Associated with paralysis sartorius. Loss of flexion of thigh. Limb extended (if glutei intact).

Glutei.—Thigh adducted. Outward rotation lost. Lordosis on standing. Frequent association with paralysis of extensors of back.

Quadriceps Extensor.—Flexion and adduction of leg (if hamstrings intact). Loss of extension of leg. Frequent association with paralysis of tibialis anticus.

Tibialis Anticus.—Often concealed if extensor communis intact. If both paralyzed, then fall of point of foot in equinus. Dragging point of foot on ground in walking. Big toe in dorsal flexion (if extensor pollicis intact). The tendons prominent. Hollow sole of foot (if peroneus longus intact).

Extensor Communis.—Nearly always associated with that of tibialis anticus. Toes in forced flexion.

Peroneus Longus.—Sole of foot flattened. Point turned inward. Internal border elevated.

Sural Muscles.—Heel depressed. Foot in dorsal flexion (calcaneus). Sole hollowed if peroneus longus intact; flattened if paralyzed. Point turned outward (calcaneo-valgus).

Extensors of Back.—Lordosis on standing. Projection backward of shoulders. Plumb-line falls behind sacrum (unilateral). Trunk curved to side. Trunk cannot be moved toward paralyzed side.

Abdominal Muscles.—Lordosis without projecting backward of shoulders.

Rigidity and contractures are striking symptoms in almost all these palsies, and for this reason they often fall into the hands of the orthopedic surgeons, who are besought to remedy the rigidly-flexed elbows, wrists, knees, and the various deformities that interfere with locomotion. Adductor spasm in the thighs, causing cross-legged progression, is nearly constant in diplegia and paraplegia. Talipes equino-varus is the most frequent pedal deformity in hemiplegia. Rarely talipes equinus and talipes equino-valgus are to be found in hemiplegia. While rigidity with contracture is the rule in all of these forms of infantile cerebral palsy, occasionally, but very seldom, cases will be met with in which the muscles are all completely flaccid. The chief

trophic disturbance encountered in these cases is retardation in growth of the paralyzed member. The paralyzed limbs do grow, but at a much slower rate than the sound extremities. Hence



Fig. 259.—Hemiplegic palsy showing drop-wrist.

the disproportion is often very striking. The earlier the onset of the palsy, the greater is this disproportion. Another peculiarity noted is that the growth of the whole organism is to a certain extent interfered with, the injury to the brain seeming to stunt development and to prevent the patient attaining his normal

stature. The patients are more or less undersized and dwarfed. Peterson describes a case in which the mother brought to him her two boys, twins, 6 years of age, for the examination of the one affected. One was a tall, well-built lad; the hemiplegic boy was small-bodied and fully seven inches shorter than his healthy brother. In all of these cases the muscles of the paralyzed and undeveloped extremities react normally to the faradic current. There is no reaction of degeneration. In many cases the affected limbs may be blue and cold, as in paralysis of the spinal type. A very rare phenomenon in these cases is a hypertrophy of the muscles, usually combined with athetosis.

Asymmetry of face and skull have been observed. Peterson and E. D. Fisher have called attention to the flattening of the skull on the side opposite the paralysis in infantile spastic hemiplegia.

Differential Diagnosis.—From infantile spinal paralysis we can differentiate, by the presence of the exaggerated reflexes, the rigidity and normal reaction of the muscles. In cerebral palsy there is no actual atrophy in the limbs. When the central neuron is involved, the inhibitory influence over reflex manifestation is lost; consequently there is an increased reflex. When the peripheral neuron is involved, the circuit being broken, the reflex is lost. There are no marked trophic changes.

Prognosis and Course.—In diplegia and paraplegia due to intra-uterine or birth¹ lesions they rarely reach the third year. As a rule they die of marasmus in infancy. In hemiplegia the prognosis is better. In most cases the paralysis may improve and the brain may not be seriously impaired. If epilepsy appears in later life, we may suspect a previous infantile paralysis.

The palsy affecting the face and the leg can usually be improved. Speech will also gradually return if improvement is noted. The late appearance of epilepsy must not be forgotten. Sometimes the paralysis is present a year or more before the onset of the epilepsy (Peterson).

Treatment.—If convulsions are present, the inhalation of chloroform or laughing gas is indicated. Anti-spasmodics, such as bromide of potassium or bromide of sodium, with or without chloral hydrate, can be given. General attention to the stomach and bowels—and dietetic management is certainly indicated.

¹ See article on Erb's Paralysis or Birth Palsy in the Newly Born Baby.

Iodide of sodium is also indicated. Counter-irritants cause excitement and sometimes do harm. J. Madison Taylor advises against the use of counter-irritants. Electricity combined with massage is useful. The faradic interrupted current will do good by stimulating the muscles. The current should be used daily; besides careful massage (muscle kneading), passive movements are of great importance. This form of exercise should be resorted to and more *good can be done* by this form of treatment than by all medication. We must not expect the bodily functions to return to normal until we have strengthened the body with restorative treatment, combined with fresh air, and by all means light nutritious food.

Some cases will not yield to medicinal treatment, and here surgical procedure has been advised. Neither trephining nor craniectomy have been successful. Allen Starr reports in a recent paper that in fifty cases operated, in these and allied conditions, the results were not encouraging.

A child 3 years old was brought to my clinic at the New York Postgraduate Medical School and Hospital. It was suffering with backward development and had distinct evidences of cerebral palsy. There was a diplegic paralysis. The head was microcephalic. As nothing could be done by general routine treatment, it was decided to try surgical treatment. A craniectomy was performed. The child died.

Other cases known to me have been operated, and the surgical treatment in all has been disappointing.

Endocrine treatment is still in the experimental stage.

PSEUDOHYPERTROPHIC PARALYSIS (MUSCULAR PSEUDOHYPERTROPHY).

We are indebted to Duchenne for an accurate clinical description of this condition.

Etiology.—This disease is usually found in children between the second and eighth years. It is more frequently observed in males than in females. There is no distinct cause of this disease.

Pathology.—The pathological lesions noted are a fatty infiltration of the muscles, changes in the breadth and contour of the muscular fibers, and an increase in the intermuscular connective tissue.

Symptoms.—Motor weakness is usually the first thing noticed. A child apparently in good health will complain of inability to walk. At the same time there will be an enlargement

of certain groups of muscles. In cases seen by me the muscles of the calves were almost as large as those of the thighs. Stewart has reported cases in which the calves of the child were as large as those of an adult. The muscles most frequently affected are the deltoids, biceps, triceps, latissimus dorsi, and sternomastoids.

Duchenne has found all of the muscles of the body hypertrophied. After the hypertrophy disappears it is succeeded by an atrophic condition. There is less muscular irritability with faradic and galvanic currents. The patellar reflex is usually absent as the disease progresses.

CASE I.—A. L., 6 years old, boy. As a baby the mother noted that there was something the matter. Walked at 2 years of age. Child was very fat, and had a good appetite at that time. Now eats but little.

Walks very erect, in soldier-like position, almost suggesting Pott's disease. Steps slowly. On table, first noted apparently strong muscular development of the back. Muscles of back, thigh, calves, apparently well-developed. Child rises from the floor with characteristic movements. Flat-footed. Cannot get up without rolling over, when reclining on back. Child looks to be in good health. Father says he is slowly but constantly growing weaker. Came to me for diagnosis, not having previously known the nature of the condition.

CASE II.—Jacob S., was first seen by me when 12 years old. Walking became impaired at the age of 6 years, gradually getting worse, so that today he cannot walk at all. The reflexes are absent. Sensation is impaired. The spinal muscles in dorsal region are atrophied. Gastrocnemii markedly increased in size. The extreme difficulty of rising from a sitting position is very characteristic. (Fig. 261.) The loss of power in the arms is quite marked also. A history of diphtheria is given just prior to the onset.

Prognosis.—The prognosis as a rule is bad.

Treatment.—The treatment consists in restoratives. Massage may be tried. Such a case should always be sent to a neurologist to outline the future course of treatment.

FACIAL PARALYSIS IN THE NEWLY BORN.

This condition is most frequently seen in the newly born after the use of the forceps. It is a peripheral paralysis resulting from traumatism. It is the result of pressure on the nerve near the exit through the stylo-mastoid foramen or where the facial nerve crosses the ramus of the jaw. The parotid gland gives little protection in the newly born. The paralysis is most fre-



Fig. 260.



Fig. 261.

PSEUDOHYPERTROPHIC
PARALYSIS.

Fig. 260.—Note hypertrophic condition of the muscles of the legs. Cannot stand without strong support.

Fig. 261.—Attempting to rise from chair. Compare atrophy of muscles of arms and spine with hypertrophy of muscles of legs.

Fig. 262.—Attempting to rise from floor. Can raise the body no higher.

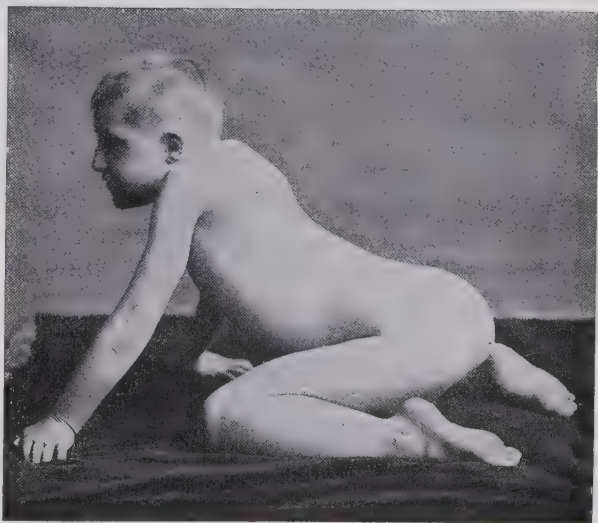


Fig. 262.

quently unilateral, as usually only one blade of the forceps causes injury.

FACIAL PARALYSIS (BELL'S PARALYSIS).

This is frequently called post-operative palsy. This disease may follow mastoid operation. It may also follow retropharyngeal abscess (Bokai).

The disease is sometimes associated with tumor in the cerebellum.

Prognosis and Course.—Great care should be exercised in expressing an opinion as to the outcome of a case of facial palsy.



Fig. 263.—Facial paralysis following mastoid operation.

In one case seen by me after a mastoid operation a permanent palsy remained. I saw the case four years after the operation.

Treatment.—This depends on the cause. Restorative treatment aided by massage and electricity should be tried. Unless some improvement is noted within a few weeks the outcome of the case will be serious.

ABSCESS OF THE BRAIN (CEREBRAL ABSCESS).

This condition is occasionally seen in children.

Etiology.—There are two principal causes of this condition: First, traumatism—injury to the head by a blow or a fall, resulting in fracture of the skull or in abscess; second, from an extension of middle-ear abscess into the mastoid cells, so that an

abscess of the cerebellum results. The infection is carried through the veins or usually along the lateral sinuses to the cerebellum. Wagner reported a case of cerebral abscess in which thrush was believed to be the cause.

The white substance of the brain is usually affected in this suppurative process. It is rarely seen in children under 1 year of age, but more frequently between the ages of 1 and 10 years. Out of 223 cases reported by Gower, 24 occurred between the ages of 1 and 9 years. Körner's statistics show that out of 77 cases of brain abscess, 25 were secondary to ear disease.

In 38 out of 40 cases, according to Körner, the bone itself is diseased.

Pathology.—Meyer reports a case of abscess which occupied an entire hemisphere. The pus found is usually greenish-yellow. At times the abscess may be encysted, in which case it is surrounded by a pyogenic membrane. Lalemand reports a case of abscess of the brain in which there was an escape of pus through the auditory meatus. The most frequent seat of the abscess is, first, the temporo-sphenoidal lobe; secondly, the cerebellum; thirdly, the frontal lobes. Other locations are very rare. Abscesses are usually single. In size they vary from that of a cherry to an orange.

Abscess of the brain, as well as meningitis and sinus-thrombosis secondary to otitis, begin, as a rule, at a point corresponding to that at which the inner surface of the bone is attached. The roof of the tympanum enters into the middle fossa, and the bony partition is sometimes as thin as writing-paper; it is for this reason that disease of the middle ear most often causes abscess in the temporo-sphenoidal lobe which lies on the fossa.

The mastoid cells are separated from the posterior fossa by a thin layer of bone, and hence abscess, secondary to disease in that region, is often situated in the cerebellum. The extension of the disease to the brain is due to thrombosis extending from the diseased bone, or from the ear, through the veins which pierce the roof of the tympanum; only rarely is there a direct communication by a suppurating tract. In common with other forms of intracranial inflammation due to ear disease, abscesses occur more often on the right than on the left side.

Symptoms.—If the child is old enough to complain, there will be headaches described over the affected area. Fever usually accompanies this condition. The temperature may rise to 104°

or 105° F. in the beginning, although cases are reported where the temperature remains normal. Vomiting usually accompanies this condition. At times in young children there are convulsions, coma, opisthotonos, and all symptoms pointing to a meningitis. When distinct areas are affected, such as the motor areas, then paralysis of the extremities may take place. Optic neuritis is sometimes present. A choked disc can sometimes be made out by an ophthalmoscopic examination. If the bones of the cranium are thin then there is usually marked tenderness over the region of the abscess.

An infant, 11 months old, suffering with marasmus developed into a normal healthy boy. He attended school until his seventh year. He then developed a swelling about one-half inch in diameter, on the scalp, directly above the lobe of the ear. There was neither pain nor tenderness on pressure. Examination of the ear revealed nothing abnormal. There was neither bulging of the lobe nor tenderness over the mastoid. The temperature ranged from 99° to 104½° F. In addition to the temperature, convulsions occurred.

An operation was performed. Necrotic tissue was found, and two ounces of pus evacuated. The mastoid was intact. The abscess was located in the frontal lobe at a depth of 3¼ inches. The case ended fatally.

X-ray.—In obscure lesions such as where a suspicion of cerebral abscess exists, a roentgenogram will aid in making the diagnosis.

Blood Count.—A differential leucocyte count, showing a marked leucocytosis in addition to a high polynuclear percentage, polynucleosis of 80 to 90 per cent., supports the diagnosis of a purulent exudate.

Diagnosis.—This is usually made when suppuration of the middle ear existed prior to this attack. If opisthotonos, symptoms of coma, convulsions, high fever, or vomiting follow an attack of acute or subacute otitis, then an extension of the suppurative process *should be suspected*. At times the diagnosis will tax the ingenuity of the most expert aurist.

The blood should be examined for the presence of a leucocytosis. In addition to an increased leucocyte count there is always a polynuclear increase.

Lumbar puncture should always be performed to exclude a diplococcus meningitis and a tuberculous meningitis. While there may be an increase in the cellular elements of the spinal fluid there will be an absence of reduction with Fehling's solution and also an absence of pathogenic bacteria in cerebral abscess.

Prognosis.—This is always grave. Our only chance for saving life is to resort to an early operation.

Treatment.—The earlier surgical relief is instituted, the better will be the result. The medicinal treatment consists in relieving symptoms such as fever by means of an ice coil, and by active catharsis. Relieve the nervous symptoms with the aid of large doses of bromide and chloral. Complete details of brain surgery are given by M. Allan Starr in his book on Brain Surgery.

ALALIA IDIOPATHICA¹ (BACKWARDNESS IN SPEAKING).

When a child is in good health and does not learn how to speak, careful examination is necessary. In such cases it is important to exclude idiocy. Although some children do not speak before they are 2 or 3 years old, their general habits and mannerisms will easily show whether or no we are dealing with mental disease.

The prognosis is excellent, although frequently parents will be very anxious and worried regarding the outcome.

Treatment.—Persistent teaching will usually remedy this condition.

IDIOCY AND IMBECILITY.

In idiocy we have a congenital absence of mentality and intelligence.

In imbecility we have an arrested development or a partial arrest of development.

Etiology.—According to Shuttleworth prolonged labor without instrumental interference is the cause of idiocy in 29 per cent. of cases admitted to his asylum. Down states that of 2000 idiots examined by him there were symptoms of suspected inanition at birth in 20 per cent. This writer also states that disturbance of the mother's physical condition during pregnancy resulted in mentally deficient offspring in about 20 per cent. Griesinger states that "violent shock and grief during pregnancy appear not to be without influence as a cause of idiocy." Consanguinity is a much disputed point. Some authors believe that blood relations invariably have mentally deficient offspring. Other equally observant writers hold the opposite view. I have seen a case of idiocy in which the father and mother were first cousins. Chil-

¹ Read also, *Very Late Speaking*, Part ii, page 151.

dren of intemperate parents, and children of syphilitic and tuberculous parents are frequently found to be mentally deficient.

Shuttleworth, a well-recognized English authority in this field, gives the following classification of idiocy:—

TABLE No. 70

| CLASS A—CONGENITAL. | CLASS B—NON-CONGENITAL. |
|--|---|
| | (a) <i>Developmental.</i> |
| 1. Microcephalic. | 9. Eclamptic. |
| 2. Hydrocephalic (also non-congenital). | 10. Epileptic. |
| 3. Scrofulous. "Mongol type." | 11. Syphilitic. |
| 4. Sensorial (also non-congenital). | 12. Post-febrile (also <i>accidental</i>). |
| 5. Primarily neurotic. | (b) <i>Accidental or Acquired.</i> |
| 6. Paralytic (also non-congenital). | 13. Toxic. |
| 7. Choreic (also non-congenital). | 14. Traumatic. |
| 8. Cretinoid: (a) sporadic, (b) endemic. | 15. Emotional. |
| | 16. From mixed causes. |

Symptoms and Diagnosis.—Great care must be taken in differentiating between backwardness and idiocy. A child that is backward in development does not remain stationary in development, but progresses *very slowly in comparison* with children of the same age; for example, a backward child of 5 or 6 years will show the mental development of a child but 2 or 3 years old. In such a case we deal with a slow mental progress, whereas an idiot shows a distinct arrest of development, both of body and mind.

Down describes Mongolian idiocy in the following language: The hair is not black as in the real Mongol, but of a brownish color, straight and scanty; the face is flat and broad, and destitute of prominence; the cheeks rounded and extended laterally; the eyes obliquely placed, and the internal canthi more than normally distant from one another (the epicanthic fold often abnormally large); the palpebral fissure very narrow; the forehead wrinkled transversely, from the constant assistance which the levatores palpebrarum derive from the occipito-frontalis muscle in the opening of the eye; the lips large and thick, with transverse fissures; the tongue long, thick, and much roughened; the nose small; the skin has a slightly dirty, yellowish tinge, and is deficient in elasticity, giving the appearance of being too large for the body.

This type occurs in more than 10 per cent. of cases; they are always congenital idiots; they have considerable power of

imitation; they are humorous; they are usually able to speak, the co-ordinating faculty is abnormal; the circulation is feeble; the improvement which training effects is greatly in excess of what would be predicated if one did not know the characteristics of this type; the life-expectancy is, however, far below the average, and the tendency is to tuberculosis.



Fig. 264.—Congenital idiocy (Lillie B.). Age 6 years. Delicate until 4 years of age. Did not walk until the fourth year. Mother cannot tell when difference in the two sides was first noted. There were no convulsions. The head measured 19 inches. There were strabismus, and deformed jaws. The mouth was constantly open. Right hemiplegia, more marked in upper extremity. Walks and runs around, but drags right foot. Contracture and spasticity present. Expression idiotic. Has never talked. Intelligence *nil*. Is restless and in nearly constant motion. (Case of A. C. Cotton.)

These children are usually found to be deaf, blind, or to have some deformity of the mouth, nose, hands, or feet. This disease usually ends fatally.

I allude to infantile amaurotic idiocy on page 972. Other forms of mental impairment are described in detail (see article on Sporadic Cretinism, page 853).



Fig. 265.—Imbecile (Louie W.). Showing anterior curve of the spine and general atrophy of all the muscles, especially those of the back and shoulders.



Fig. 266.—Imbecile (Louie W.). Showing normal position of head flexed on the chest. Can only lift head by raising chin with extensor muscles of hand and forearm.

AN IMBECILE HAVING MICROCEPHALY AND PSEUDOMUSCULAR ATROPHY.—Louie W., 5 years old, was referred to me through the courtesy of L. S. Manson.

Previous History.—This child was born at full term, natural labor, no forceps. He was breast-fed about fifteen months; could not stand, walk nor talk until 2 years old. Dentition began during the ninth month, which

was very early in this family, as all the other children teathed at fifteen months. He had measles when 2 years old, influenza and pneumonia when 3 years old. The boy has an unusually small skull, 16 inches in circumference; the normal circumference at this age is about 21 inches.



Fig. 267.—Imbecile (Louie W.). Showing position assumed in walking. Cannot stand on feet.



Fig. 268.—Imbecile (Louie W.). Showing drop wrist and foot.

Family History.—The mother had been married twice, had six children with the first husband and five with the second. Three children died of scarlet fever. The rest of the children are strong and healthy. There is no family history of idiocy or nervous disease on either father's or mother's side.

The mother first noticed trouble when the child was 2 years old, when he began to go about on his knees, having never walked on his feet. He

has no power in the hands or feet; speaks very little, voice tremulous. Tic of small muscles of chin; knee-jerk both present. There is great muscular weakness of the lower extremities and muscles of the back. There was drop-wrist and foot and universal wasting of the muscular system without marked trophic changes. Normal position of the head is that of flexion on chest and can only lift head by raising chin with extensor muscles of hand and forearm. Fibrillary twitching of all the muscles in hands not amounting to athetosis.

INFANTILE AMAUROTIC FAMILY IDIOCY.

According to Weeks the condition is due to degeneration of the retinal neurons at the macula.

This peculiar condition has attracted considerable attention despite its rarity. Tay, of England, described a case of symmetrical changes in the macula lutea. The child could not sit erect and was backward mentally. John Claiborne, reviewing this subject, refers to the above case, and says:—

At the first examination the optic disc was normal, but at the macula there was a white, more or less round area, in the center of which was a brown spot. The picture was similar to that seen in embolism of the central artery of the retina. Tay at first thought it was a congenital change. Five months later he noticed the optic disc was atrophied. Three months later he observed 3 other cases in the same family. In all the ophthalmoscopic picture was the same, and all these persons died before the end of the second year of the disease. Similar cases with the same ophthalmoscopic picture were described by Magnus, Knapp, and others. Sachs reported a case which impressed him as being one of idiocy; this was particularly interesting on account of the changes observed in the cortical cells. The family character of the affection was suggested to him after observing 4 cases in two families. Kingden, of England, published a case and showed a picture which eye surgeons said belonged to the disease which Sachs had elucidated. Sachs reviewed the subject, tabulating 29 cases.

A. Jacobi reported 3 cases of this form of idiocy to the American Pediatric Society.

Pathology.—Sachs states that the external configuration of the brain exhibits a distinct picture of a lower order of development. It is difficult to state whether the changes were to be regarded as primary degenerations or due to an arrest in development.

Symptoms and Diagnosis.—There is a milky-blue or white optic disc with bright cherry-red center occupying the place of the macula lutea. Nystagmus is frequently present. Hydrocephalus has been reported associated with this condition. The weakness of the extremities increases slowly until diplegia appears. In such cases the optic symptoms and idiocy are pronounced, and from these two conditions alone, the diagnosis can be made. The voluntary muscles are relaxed, especially those of the abdomen. Death usually comes at the end of the second or third year, although the disease may last years. The child is totally blind.

Treatment.—No treatment has as yet modified or benefited these children.

CONCUSSION OF THE BRAIN.

This is usually caused by a sudden jolt, shock or shaking up of the brain, most frequently the result of a child falling down a flight of stairs. A blow on the head may also cause concussion.

Symptoms.—Vomiting is the earliest manifestation of concussion. As a rule there is no elevation of temperature. There may be somnolence or stupor. The pulse is usually regular.

Severe concussion may cause aggravated symptoms lasting a few days. Nose bleed and hemorrhagic areas in the sclera of the eyes may also be present.

Differential Diagnosis.—Spinal fluid withdrawn by lumbar puncture will show a normal fluid. The absence of pathogenic bacteria differentiates this condition.

Treatment.—A very hot tub-bath should be given. This to be followed by an ice-bag to the head. Liquid diet and a mild laxative should be ordered. Rest and quiet aided by bromides are indicated.

CASE I—Mild Form.—A boy, 7 years old, rolled down a flight of stairs. I saw him about one hour after his fall. There was nausea and vomiting. Some slight abrasions of the skin were present, and a scalp wound one inch in length which required a stitch. The temperature was 100° F. The boy was put to bed. I saw him about twelve hours later. He was perfectly normal and complained of intense hunger. On the following day the boy was apparently well.

CASE II.—Severe Concussion of the Brain.—Child S. was seen by me through the courtesy of E. D. Lederman, with the following history: He was in his fourth year, bottle-fed during infancy, and excepting an occasional attack of dyspepsia, had always enjoyed good health.

Present Condition.—Three days before I saw him he fell and struck his head violently on the pavement. Six hours later, severe vomiting set in. During the night following the fall he was feverish and moaned continually. On the following day when Lederman saw him the temperature was 103° F. The child seemed to be dazed and in a stupor at times. He was very thirsty. There were marked evidences of clonic and tonic spasms in the muscles of the body. A laxative was ordered. The gastro-intestinal tract was cleaned and an ice-bag applied to the head. These same symptoms continued, the fever rose to 105° F. and was not easily reduced. When I saw him in consultation with Lederman there were spastic conditions of the muscles of the arms and legs. There was marked rigidity of the spine. The sterno-cleido-mastoid muscles were rigid. There was marked opisthotonos. Severe photophobia. The pupils were dilated and did not respond to a strong light. The Babinski reflex was present on the right side, but not so positive on the left side. When moved about the child moaned as though in pain. A tache cérébrale was also present. The diagnosis of concussion and traumatic basilar meningitis was made. A lumbar puncture was made and almost one-half ounce of turbid (milky) cerebro-spinal fluid was withdrawn. The child passed urine involuntarily (evidently due to bladder paralysis). The case ended fatally.

PART X.

Diseases of the Ear, Eye, Skin, and Abnormal Growths.

I.

DISEASES OF THE EAR.

ACUTE CATARRHAL OTITIS MEDIA.

ACUTE catarrhal otitis media arises in the great majority of cases from extension of an inflammatory process by way of the Eustachian tube.

Etiology.—Burkens found 104 deaths in 33,107 ear cases, and Randall 15 in 5000, giving a percentage of three-tenths of 1 per cent. from intracranial disease.

Schwartz records 30 deaths in 8425 ear cases, or 0.35 per cent. The death rate from purulent ear diseases, compared with all other diseases treated, was shown in Guy's Hospital, in London, some years ago, to be 57 deaths among 9000, two-thirds of 1 per cent.; 40,073 autopsies in the Vienna General Hospital showed 232 deaths from otitic complications, *i.e.*, 0.58 per cent. The majority of these deaths occurred in the course of chronic sup-puration of the middle ear, complications in the acute stage, with the exception of mastoiditis, being less frequent.

Nasopharyngeal disease, especially the infectious diseases, such as measles, scarlet fever, influenza, and diphtheria, are frequently followed by otitis. The ease with which pathogenic bacteria can cause an inflammatory extension from the nose into the Eustachian tube is now recognized. Children of the lymphatic and rachitic types are more susceptible to these infections.

When a catarrhal process limits its attack to the lower portion of the middle ear chamber, the disease may run its course without becoming purulent. When, however, the upper part or tympanic attic is involved, we are more apt to find that the infection assumes a suppurative type. It is in this class of cases

that complications arise and extension to the mastoid cells by way of the aditus soon follows.

Bacteriology.—Observers have found that even in the normal tympanic cavity, pathogenic bacteria exist. Consequently any deviation from the normal process in this region predisposes the individual to a purulent infection. A passive congestion of the tympanic mucous membrane due to cardiac, renal, naso, or nasopharyngeal disease, must be considered a potent factor in the production of a suppurative otitis. Staphylococci, diplococci, and streptococci have been found in the nasopharyngeal space, and it is reasonable to suppose that these micro-organisms are apt to find their way into the Eustachian tube and tympanic cavity even under normal conditions.

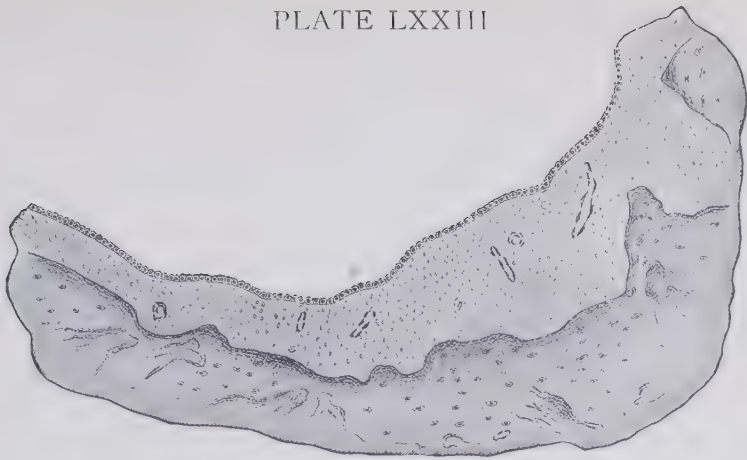
Pathology.—We must bear in mind that the ossicular chain is surrounded or enveloped by folds of mucous membrane, and when this tissue becomes engorged drainage from the attic is difficult. Consequently our incisions through the upper and posterior portion of the membrane in acute otitis should be deliberate and somewhat heroic, otherwise we will not accomplish the object in view, *i.e.*, drainage from that portion of the middle ear which is most likely to be followed by disease of the mastoid antrum and cells.

Symptoms.—Two prominent symptoms are always present; one is pain and the other fever. The infant is usually very restless, rolling the head from side to side on the pillow and rubbing the hand over the affected ear. At times the nose and throat will also be inflamed. Local tenderness can usually be made out on pressure.

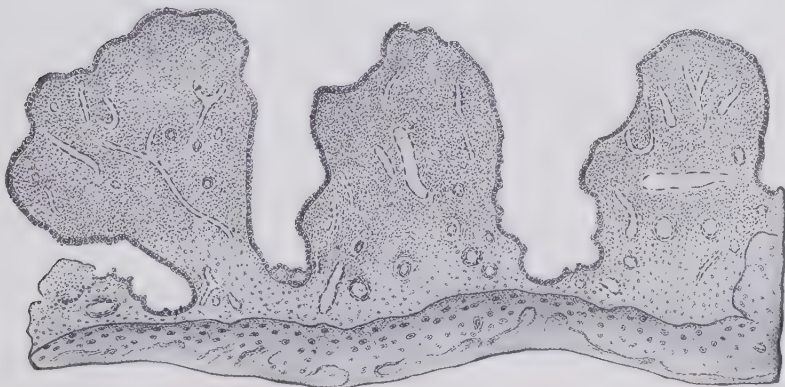
An examination of the ear will show a reddened and bulging drum. Tenderness of the mastoid is absent. The adjacent glands are not enlarged. The temperature varies between 101° and 103° F. and it may reach 105° F.

Meningeal symptoms such as rigidity of the neck and vomiting rarely occurs in this condition. When such symptoms occur then mastoid involvement should be suspected.

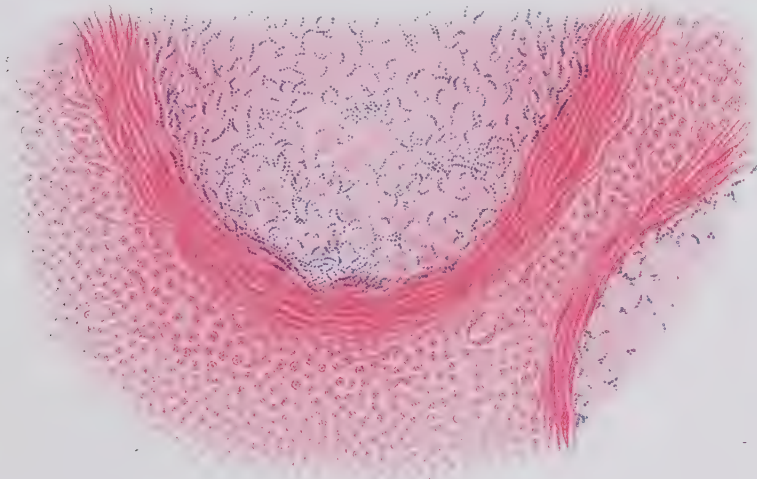
Diagnosis.—This is not difficult if the ears are carefully inspected. If a paracentesis has been performed and the symptoms continue, then an x-ray of the sinuses and mastoid will aid in eliminating a doubt as to the extension of this infection. In the absence of an x-ray, translumination is helpful.



Normal mucous membrane of the middle ear in the newly born.



Inflammation of the mucous membrane of the middle ear. Section of infiltration with polypoid excrescences.



Section of the vessel of the mucous membrane containing streptococcus pyogenes. (*S. Weiss.*)

Prognosis.—The prognosis is reasonably good. We must not be too positive in giving a good prognosis, as sometimes fatal results follow the extension of the inflammatory condition from the middle ear into the brain.

Treatment.—A local application of $\frac{1}{2}$ per cent. phenol in glycerine on cotton will relieve pain quickly. If, however, the pain continues, and the temperature rises then prompt drainage by an early incision through the bulging membrane is the treat-



Fig. 269.—Complication of scarlet fever seen in my service at Riverside Hospital.

A study of this case, in which both ears were discharging, is interesting. The temperature was only $99\frac{1}{2}^{\circ}$ F. in the rectum. This proves that we must always be on the lookout for suppuration of the middle ear in the acute infectious diseases.

ment indicated. To further drainage under such conditions it is wise to douche the ear with hot antiseptic solutions at a temperature of 103° to 105° F., using a return-flow cannula. It has been claimed that the higher the temperature of the douche, the greater the possibility of absorbing the threatening mastoiditis.

The ear may be syringed every hour with powdered borax, 2 drams; warm water, 2 pints (103° to 105° F.). After wiping the ear dry, plug with a strip of sterile gauze. Oily combina-

tions should never be used as local agents in aural disease. They are apt to become rancid, and as the middle ear is an excellent incubator, affording bacteria, plenty of heat and moisture, infection rapidly occurs.

General Treatment.—Peroxide of hydrogen or dioxygen is a valuable cleanser and deodorizer when the perforation of the membrane is large. The same remedy may cause extension of a purulent otitis if the aperture in the drum is small, and the liberation of its oxygen causes sufficient pressure to force the purulent foci backward through the aditus. Bulging of the upper portion



Fig. 270.—Ear syringe.

of the membrane with a protrusion of the superior and posterior walls of the external auditory meatus, together with tenderness over the mastoid antrum or tip, with some elevation of temperature, occurring during the course of an acute otitis, are indicative symptoms of mastoid involvement. Extensive disease of the mastoid cells may exist without the slightest rise in temperature, especially if the acute stage of the inflammatory process has passed.

We may safely assume that in all cases of catarrhal otitis the mucous membrane lining the mastoid antrum is involved simultaneously with that of the middle ear, as it is part of the same tissue. Therefore Wilde's incision carried through the posterior superior quadrant of the membrane is certainly a rational procedure.

MASTOIDITIS.

When fever continues during acute or subacute otitis and the child is peevish and restless, it is important to eliminate an extension from the middle ear into the mastoid.

Etiology and Bacteriology.—An acute mastoid infection is very common as a sequel to the acute infectious diseases, notably: Influenza, scarlet fever, measles and diphtheria.

There is no specific micro-organism characteristic of this condition. While in one case the pneumococcus will be found, another case will have a streptococcus or a staphylococcus in the purulent discharge.

The blood does not show a distinct picture which is pathognomonic of this condition. A leucocytosis is usually present.

Symptoms and Diagnosis.—Whiting gives the following as the most important diagnostic signs in acute mastoiditis:—

1. Pain in the mastoid region.
2. Hemicrania of corresponding side.
3. Copious discharge becoming scanty with increased pain over mastoid.
4. Temperature, 102° to 104° F.
5. Pulse and respiration correspondingly high.
6. Sagging of post-superior fold of membranous meatus.
7. Bulging of membrana tympani significant, especially if perforated through Shrapnell's membrane.
8. Palpation eliciting mastoid tenderness:—
 1. Over the antrum.
 2. Over the tip.
 3. Point of emergence of emissary vein.
 4. Premastoid lamina or post wall of bony meatus.

MASTOID OPERATION ON INFANTS AND CHILDREN.

In operating on infants and children it is important to remember certain points wherein they differ from adults. These briefly mentioned are the following:—

At birth, in the mastoid the antrum exists as the only cavity, about the size of a small pea; the process is not formed until after the end of the first year, and the pneumatic spaces not until puberty.

There are also frequently dehiscences filled with fibro-cartilage as the squamo-mastoid suture is not ossified at birth. So

when making the primary incision, the knife must be used gently until the periosteum is reached, and this likewise must be raised with the greatest care to prevent, in such cases, the instruments slipping into the cranial cavity.

In curetting after opening the mastoid, it must be borne in mind that the bone tissue in childhood is soft, so that healthy tissue need not be sacrificed unnecessarily.

The Operation.—During the operation, strict antisepsis must be observed. The space around the mastoid for two or three inches beyond should be shaved and made surgically clean. The auditory canal should be irrigated with a bichloride solution of 1 to 1000. Then under complete anesthesia, with a scalpel, curvilinear incision should be made from end of the mastoid close to the insertion of the auricle to about one-half inch of its upper border, down to the periosteum. This is then separated.

The bleeding is controlled either by clamping vessels, or with gauze wrung out of hot water. An Allport retractor or one of its modifications should then be used, which not only answers the purpose of its name, but also stops the oozing. The parts should be separated with the auricle held forward so that the posterior and superior walls of the auditory canal and the whole field of operation is exposed to view.

If the bone is bathed in pus this is wiped away and any perforation is examined with a probe. The opening is enlarged, either with a spoon or rongeur. Should no perforation or sinus exist, then the antrum should be opened either with a flat chisel or gouge and a mallet. The suprameatal triangle is above the antrum. This is made by drawing one line horizontally with the superior border of the auditory canal, a second vertical one with the posterior, and a base line corresponding with the curvilinear line between these points.

The chisel should be used gently and tangential, and the bone chipped away in small sections, always working downward, forward, and inward. A probe should be used to determine from time to time whether the antrum has been entered, and also to examine the cavity made.

As soon as an opening has been made, a rongeur should be used to enlarge it, and then thoroughly cleaned out with a Volkman's spoon. The space leading from the antrum to the roof of the tympanum, that is, the aditus and attic, should be carefully cleaned out with a small curette. The antrum should then be

carefully extended backward until the lateral sinus is exposed and inspected as to whether its appearance is healthy. Its presence can be determined by its bluish appearance and the soft feel to the probe. All granulations and soft tissue having been cleaned out, the parts are gently irrigated with a bichloride solution of 1 to 5000, normal salt solution, saturated solution of boric acid, or sterile water if considered necessary. The wound is then wiped dry, the upper and lower ends can be stitched together, and the rest packed somewhat lightly with iodoform gauze. Bury this gauze; that is, do not let it project; then over this

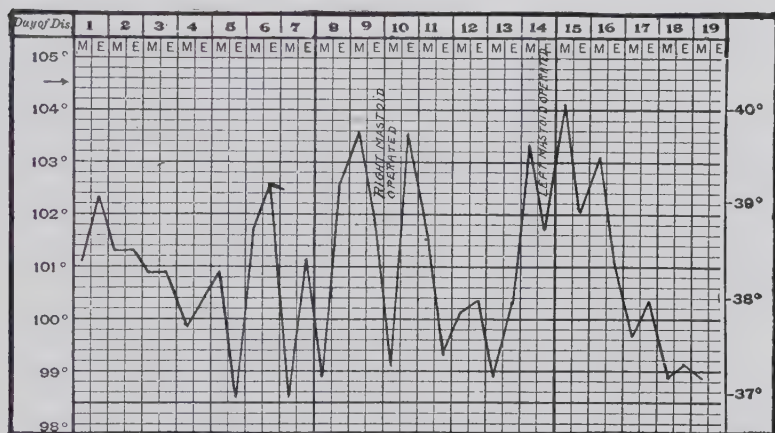


Fig. 271.—A common type of acute mastoid inflammation following influenza. There was a double otitis before the extension to the mastoid cells. Note the fever curve following the operations. Case recovered.

draw the parts together and apply layers of sterile gauze, absorbent cotton, and a bandage.

After-treatment.—Unless pain or a rise in temperature occurs, it is frequently not necessary to change the dressing for five or six days. Usually there is no discharge in the auditory canal; if there is, it is gently irrigated or wiped out. For the mastoid wound, a dry wiping is all that is necessary usually, and a dressing of sterile gauze used lightly packed. This can be changed every two or three days. Granulation tissue of course must be cauterized.

Accidents During the Operation.—*Wounding the lateral sinus* may cause a profuse hemorrhage. If the bony cortex has been sufficiently removed, the sinus may be plugged with iodoform

gauze and the operation completed. The sinus whenever exposed should be kept covered with iodoform gauze separate from the rest of the cavity to prevent infection. If the vessel should not be sufficiently freed from the bony covering, the bleeding may prevent the completion of the operation.

Exposure of the Dura.—If carefully dealt with, this is not a matter of much importance, if the part is kept covered with iodoform gauze independent of the rest of the wound. If the dura should be wounded it should be opened, cleaned, and sewed up with fine catgut sutures.

Facial Paralysis.—In operating, this condition can be prevented by not interfering with the lower two-thirds of the posterior wall of the auditory canal and the facial nerve will escape injury. Where it has been slightly injured, the function of the nerve is usually restored within four to six weeks.

Francis M. C., 1 year old, suffered with gastric disturbance, poor appetite and symptoms resembling colic. His bowels moved sluggishly, the stool was greenish and contained mucus and undigested particles of casein. He emaciated owing to the non-assimilation of food. From the history I learned, that the child has had fever accompanied by catarrh of the nose and a general bronchitis for the last four weeks. The examination of the body showed a decidedly rachitic thorax and distended abdomen; retarded dentition and general backwardness in development. There was no evidence of pulmonary disease. The heart-sounds were feeble and a hemic murmur was distinctly heard at the apex of the heart and also in the vessels of the neck. The child perspired very freely. The temperature was 102.4° F., pulse 140, respiration 28. The throat showed enlarged tonsils and also adenoid vegetations. This latter condition was reported by Charles D. Manson. Both ears were discharging. The child was very restless, moaned and fretted continually and did not sleep at night. My diagnosis was influenza, subacute gastric catarrh, rachitis, and mastoid involvement. Edward Dench saw this case at my request and corroborated the diagnosis. The temperature rose to 103.6° F. The right mastoid was opened by Dench at the New York Ear and Eye Infirmary. The temperature came down by lysis to normal. Three days later, while the child was doing quite well, the temperature again rose to 103.6° F. A left mastoid was suspected, and accordingly the second operation was performed. On the day following the operation the temperature rose to 104.2° F., and an acute milk infection was suspected. With the aid of *mist. rhei et sodii* and a diet of whey only, at intervals of three or four hours, the stomach symptoms subsided, and four days later the child was removed from the hospital to its home in a normal condition. With careful asepsis both wounds healed. The child gained in weight and within one month had entirely recovered.

SINUS THROMBOSIS.

Mastoiditis is occasionally followed by a secondary infection of the lateral sinus.

Symptoms.—There is usually a sudden rise in the temperature, ranging from 100° to 105° or 106° F. The temperature rises rapidly and falls rapidly. Unusual variations will be noted in the temperature so that it will drop from 106° to 98° F. and again rise to its former height. Bacteremia is usually present. The blood shows a marked leucocytosis and a high polynuclear percentage. In doubtful cases a blood culture should be taken.

Treatment.—The treatment is surgical. In many cases resection of the jugular vein is necessary. The outcome of the case depends on the vitality of the child at the time of operation.

Serum Treatment.—When we are dealing with a pneumococcus infection, an injection of antipneumococcus serum, 30 to 50 cubic centimeters, may do good. If no benefit follows, repeat the injection in twenty-four hours.

The serum is indicated if resistance is low with a correspondingly low leucocyte count in the early stages of the disease.

FOREIGN BODIES IN THE EAR.

Insects, bugs, cotton, beads, and pieces of pencils are frequently found in the meatus. When beans or peas remain they swell and cause painful pressure symptoms. The specialist should invariably be consulted rather than risk the danger of traumatism in unsuccessful attempts at removal. If a live insect or bug is in the middle ear, pour water, oil, or alcohol into the ear. If the insect is not dislodged by this means try Allen's foreign-body forceps.

II.

DISEASES OF THE EYE.¹

ACUTE CATARRHAL CONJUNCTIVITIS.

This condition is usually associated with infectious diseases. As a rule it is found in coryza, the acute exanthemata, influenza, and the usual infections due to pathogenic bacteria in the atmosphere.

General Plan of Cleaning the Eye when Secretion Exists.—The eyes should be thoroughly cleansed with a pledget of cotton dipped in lukewarm water. Then use a drop or two of a solution of novocaine:—

R Novocaine² solution.

Sig.: Drop two drops into each eye. Repeat in fifteen minutes, until local anesthesia results.

After instilling the novocaine, a few drops of a 2 per cent. argyrol solution should be dropped on the eyelid. The irritating secretions should be wiped away as frequently as possible. A weak solution of borax, applied on cotton, will best serve to cleanse the eye. It should be used at a temperature of 100° F., hourly if necessary.

A solution of borax:—

| | |
|--------------------------|------------|
| R Biborate of soda | 4 parts. |
| Distilled water | 100 parts. |

Or:—

| | |
|-----------------------|------------|
| R Argyrol | 1 part. |
| Distilled water | 100 parts. |

are very good cleansing remedies.

Peroxide of hydrogen,³ one-half strength, is recommended by Stephenson, to be used three times a day.

To prevent the lids from gluing together the yellow oxide of mercury ointment should be applied two or three times a day:—

¹ The correction of errors by refraction, such as astigmatism by means of eye-glasses, and the treatment of strabismus, should only be undertaken by the specialist. The reader is referred to special works on Diseases of the Eye for particulars regarding these conditions.

² Novocaine tablets are also sold under the name of Procaine tablets.

³ A good preparation on the market is called dioxygen.

| | |
|---|-----------|
| R Yellow oxide of mercury (5 per cent.) | 1 part. |
| Vaseline | 10 parts. |
| Lanoline | 10 parts. |

PINK EYE.

This form of acute ophthalmia is similar to the one just described. It is very communicable and most probably transmits infection by a specific organism.

Weeks¹ was the first to describe a definite micro-organism causing this disease. The Weeks bacillus is short and has rounded ends. It stains very easily with methylene blue. It is intensely contagious and spreads rapidly, especially in schools. Children under fifteen years are especially susceptible.

The diplo-bacillus of Morax was described by him in June, 1896, in the *Annal de l'Institut Pasteur*. The inflammation is frequently due to the presence of the diplo-bacilli. The inflammation usually begins in one eye and infects the other a few days later. Its course may be either chronic or acute. Gauze saturated with warm boric acid solution should be applied over the eye, and warmth continued by the external application of an electric pad or hot water bottle. Some cases respond better to cold applications, but these are exceptional.

PNEUMOCOCCUS OPHTHALMIA.

This disease is frequently seen in newly born children in which the lachrymal sac suffers.

Grifford² described an epidemic in Omaha where several distinct outbreaks took place within a few years.

Veasey³ states that the pneumococcus is the most frequent cause of ophthalmia in Philadelphia. The bacteriological examinations of the organisms are very easily made. A cover glass smeared with the pus, stains well with methylene blue. Under the microscope there are diplococci, cocci, and chains devoid of capsule.

Infection of the conjunctiva sometimes occurs. This is frequently the result of impetigo contagiosa of the face or scalp. Infected secretions transmitted to the eye by the fingers usually set up this inflammation. Little girls frequently transmit vaginal

¹ Archives of Ophthalmology, 1886, No. 4, p. 441.

² GRIFFORD: Archives of Ophthalmology, vol. xxv, 1896, p. 314.

³ VEASEY: Archives of Ophthalmology, vol. xxxviii, 1899, p. 301.

discharges on their fingers and thus cause infection. The common cocci of suppuration, namely, *staphylococcus pyogenes aureus*, *albus*, and *citreus*, are usually found in this discharge.

Treatment.—Clean the eye by dipping small pledgets of absorbent cotton into lukewarm water, or dip the cotton into a 2 per cent. solution of borax. After thorough cleansing of the eyelids, they should be massaged with a 2 per cent. yellow oxide of mercury ointment, repeated once daily.

Very hot water applied on pledgets of sterilized cheesecloth will reduce the inflammation of the lids. In other cases, cold lead and opium wash will be very soothing and have a similar effect. We can prevent the lids from sticking together by applying vaseline at night.

PURULENT OPHTHALMIA (OPHTHALMIA NEONATORUM).

This is a purulent conjunctivitis of the newly-born infant. It may be seen several hours, or sometimes appears several days, after birth. The amount of pus secreted is very large. When the lids are separated pus will be liberated.

Etiology.—It is usually caused by an infection in the maternal passages containing the gonococcus during labor. The pneumococcus has also been found in some cases. These pathogenic bacteria are carried directly into the eye, either by the secretions or by means of infected sponges or towels. Bacteriology has proven that all causes excepting distinct germ infection must be eradicated.

Symptoms.—The lids appear red and swollen. The upper lid frequently overhangs the lower and the infant is unable to open the eyes. Stephenson states that 10 per cent. of children so affected remain totally blind. Of 446 cases of ophthalmia occurring in the practice of seven physicians quoted by Stephenson, gonococci was found in 72.83 per cent. In Stephenson's own cases, out of 45 affected, 30 showed evidence of the gonococci, or 66.5 per cent.

Treatment.—The Credé method is now universally used. As soon as the infant is born and the face wiped clean, the following solution is dropped into the eye:—

R Nitrate of silver solution 2 per cent.

Sig.: It is best to let it fall from a medicine dropper on the eyeball. A slight inflammatory reaction is occasionally seen and if treated with a cold solution of formalin, 1 to 2000, disappears quickly.

MEMBRANOUS CONJUNCTIVITIS (DIPHThERITIC CONJUNCTIVITIS).

We occasionally see membranous patches on the surface of the conjunctiva. This membranous deposit is sometimes distinctly diphtheritic, a culture taken showing the presence of the Klebs-Löffler bacillus. To differentiate clinically between the diphtheritic and non-diphtheritic type is sometimes impossible. I have seen membranous conjunctivitis at the Willard Parker Hospital in which the disease clinically resembled diphtheria and still the Klebs-Löffler bacillus was absent. In one case seen by me the streptococcus alone was present. The clinical history of the case is an important guide in the diagnosis. If another case of diphtheria exists at the same time in the same house, the question of transmission should have weight in making the diagnosis. Every case of membranous conjunctivitis requires a careful inspection of the fauces. If croupous laryngitis is present, then a greater probability of diphtheria is warranted.

Symptoms.—A grayish-yellow patch can be seen on the conjunctiva. The lids are very tender and swollen. They feel hard and thick on palpation, and cannot be everted. Ulceration or sphacelation of the cornea usually follows. The same systemic disturbances may be noted as are found in diphtheria affecting the throat. There is usually fever, glandular enlargement, loss of appetite, general prostration, and cardiac disturbances, as has been described in the chapter on Diphtheria.

Prognosis.—A very guarded prognosis is necessary, as the outcome of the case depends upon the care bestowed and the time when the case was first seen. If the disease has been established a long time, a greater destructive tendency must be presumed than if the case was seen when it first originated.

Treatment.—First isolate. The communicable nature of this disease must be remembered. The family and friends should be warned of the danger.

Local Treatment.—If the eyes are thick and swollen, an ice-bag or ice-cold pledgets of cotton soaked in bichloride, $\frac{1}{2}$ to 2000, should be applied. They should be renewed every five to ten minutes night and day, to produce a good result. In other cases warm, moist applications will alleviate pain and also reduce inflammation.

Specific Treatment.—Diphtheria is diphtheria whether it is in the eye or in the throat, hence an injection of 5000 units of antitoxin

should be given regardless of the age of the child. The same internal treatment which is described in the chapter on Diphtheria is recommended if we desire successful results in these cases.

GRANULAR OPHTHALMIA (TRACHOMA).

The characteristic feature lies in the development on the palpebral conjunctiva of the so-called "sago grains."

Granular lids must be carefully considered owing to their disastrous tendency.

TABLE NO. 71.¹

| <i>Follicular Conjunctivitis.</i> | <i>Trachoma.</i> |
|--|---|
| Begins as small reddish elevations, sparsely arranged in rows on the conjunctival surface of the lower lid, extends later to the fornices, where large sago-grain follicles may extrude on everting the lids. Conjunctival surface between the follicles approximately normal. | Begins as irregularly placed granulations on both lids and fornices. Each fornix involved early in the disease. A ring of ocular congestion covered with glistening granulations extends outwards from each fornix over the eyeball. Conjunctival tissue is involved over entire surface of each lid early in the course of trachoma. |
| Blood vessels apt to be clear and distinct to view. | Blood vessels obscured by congestive infiltration of entire palpebral surface. |
| Lesion more superficial than that of trachoma, the follicles projecting from the conjunctival surface and not involving the entire lid structure. | Lesion deep, involving tissue beneath the conjunctiva. If untreated or badly treated, is sure to involve the cornea sooner or later. Terminates in extensive formation of scar tissue, whose roughened surface damages the transparency of the cornea. |
| Pannus never occurs. | Pannus apt to occur in long-standing cases. |
| Never involves the cornea in uncomplicated stage. | Mucopurulent secretion in acute stage and during any exacerbation. |
| No secretion of muco-pus. | A contagious disease. |
| Very slightly communicable. | To be excluded from school. |
| Need not be excluded from school at any time. | |

This disease may frequently assume an epidemic nature. During the last two years hundreds of cases have suddenly ap-

¹ CARHART: Medical Record, March 30, 1918.

peared in our city. The ease with which all infectious diseases spread in the congested portions of our city applies to trachoma. For this reason school-children and inmates of institutions and hospitals should have the eyes carefully inspected on admission to exclude trachoma. In our country the native American Indian suffers from this disease, so do the Irish, Polish, Italians, and the Teutonic races. It is therefore quite probable that this disease is spread more or less among all races. One race is exempt, namely, the negro.



Fig. 272.—Trachoma, showing round, opaque bodies in upper and lower lids. "Sago grain" type. From a photograph—type frequently seen in children.

Treatment.—Of all methods, *expression* is the method generally used. The morbid tissue is thereby dislodged and removed. Actual cauterization, galvano-cautery, or the solid nitrate of silver stick is mentioned by some, but should be used only by those familiar with the eye.

The application of 5 per cent. citrate of copper ointment to the follicles of the conjunctival surface, and massage either in the form of the bichloride rub or ophthalmol solution on cotton-wrapped applicator will often cause the speedy absorption of the follicles of the disease.

BLEPHARITIS.

This disease is characterized by a sub-acute or chronic inflammation along the margin of the lids.

Two classes of cases might be noted. *First*, those in which slight crusts appear on the edges which, when cleared off, show no loss of substance; simply reddened margin. This would include the cases of marginal eczema, so called. *Second*, those cases which, when cleared of crusts, show ulceration.

At first they present a dusky margin and gluing together of eyelashes, due to excessive secretion, which gradually progresses. Beneath the crusts ulcers form. Excoriations and pustules about the hair follicles interfere with the growth, so



Fig. 273.—Method of everting eyelid. (After Davis and Douglass.)

that the lashes fall out or become stunted. The vascularity continues, increasing the thickness of the lids with new connective tissue. The gradual contraction of this new scar tissue leads to eversion of the lids with resulting epiphora, or overflow of tears, presenting a disagreeable, raw-looking surface.

Treatment.—The treatment consists of removing the crusts or scabs by any warm alkaline lotion, such as bicarbonate of soda, or borate of soda, 10 to 20 grains; aqua, 1 ounce. Massage of the lids with red or yellow oxide or white precipitate, 2 to 8 grains; vaseline, 1 ounce, should follow.

A mild ointment should be used—a strong one increases the irritation. All refractive errors must be corrected. Epilation of

the lashes sometimes promotes a cure when commenced in the early stages of the disease. The general condition of the patient must be looked after, and iron, arsenic or codliver oil, and hygienic treatment as indicated should be prescribed.

HORDEOLUM, OR STYE.

This disease is characterized by an inflammation of the connective tissue about a hair follicle along the lid margin. A hard, circumscribed, inflammatory nodule forms, which may suppurate. Occasionally, it remains as a hard lump, and still in other cases the lid becomes swollen and edematous. A close examination, however, will show the inflammatory spot, which as soon as it appears yellowish should be incised and the pus evacuated.

Treatment.—The general treatment consists in hot applications to favor resolution. To prevent successive crops, the massaging of the lids with an ointment of hydrarg. ox. flav., $\frac{1}{2}$ to 2 grains; vaseline, 2 drams, has an excellent effect. The infection from the pus may be prevented by the use of argyrol in a 5 per cent. solution, one drop two or three times daily.

These successive styes show some disease of the lid margin, as blepharitis, some derangement of the general system, or eye-strain, especially in hypermetropia.

PHLYCTENULAR CONJUNCTIVITIS.

This affection is one of childhood and is seen in malnutrition after the acute exanthemata; also in marasmic or scrofulous children.

Small elevated spots, papules, or pustules the size of a mustard seed are found in this condition. When the epithelial covering is shed they become superficial ulcers. They are either single or multiple, and appear as pinkish, yellowish, or grayish spots. There is very often a great dread of light—photophobia—which leads to spasms of the lids—blepharospasm. There are also at times pain, burning sensation, and lachrymation.

Treatment.—*Local treatment* consists of bathing with a saturated solution of boric acid. If any excoriation exists at outer canthus, touching it with nitrate of silver generally effects a cure.

If the symptoms show that the condition is subacute or chronic then stimulating applications are required, as:—

℞ Hydrarg. ox flav. 4 to 8 grains.
 Vaseline 1 ounce.
 M. and apply three times a day.

I have had excellent result by touching the affected parts lightly with a solid stick of alum or copper.

If there is much corneal involvement:—

℞ Atropin sulph. $\frac{1}{2}$ grain.
 Aq. dest. 2 drams.

Sig.: One drop in the eye once or twice daily may have to be used.

For the blepharospasm, a forced opening of the lids, an occasional drop of a 2 per cent. solution of novocaine, or a sudden spray or shower of cold water will relieve the condition.

General Treatment.—This consists in the hygienic care of the child and tonic treatment. The eyes should be kept clean and open, dark glasses should be worn if necessary. No dark room, bandages, or eye shields should be allowed. The bowels should be regulated. The diet should be looked into. All sweets interdicted, meat given occasionally, and milk foods ordered. Give plenty of fresh air, outdoor exercise and bathing. Tonics, such as codliver oil, syr. ferri iodide, strychnine, etc., should be given.

III.

DISEASES OF THE SKIN.

ECZEMA.

THE skin disease most frequently met with during infancy is eczema. The disease, in older children, runs a course similar to that in adults. In younger children and infants it has certain different features.

It is a papular, later scaly eruption, and is accompanied by intense itching. It is rarely accompanied by fever.

Etiology.—Children who have a delicate skin, easily irritated by external irritants, either chemical or mechanical or by bacteria, are susceptible to this disease. Such a skin has a more intense glandular activity. This also is a predisposing factor.

Overfed children, especially infants who are fed with an excessive quantity of carbohydrate or fat are the main sufferers of this disease. Children with low sugar tolerance are often eczematous. Local irritation, such as irritant discharges between the thighs, under the arms, and on the cheeks or lips, frequently causes eczema. Intolerance to certain proteins and fats results in anaphylactic exudations. Such cases usually develop eczema. Breast-fed as well as bottle-fed infants are susceptible.

Heat, cold air, wind, and the use of hard soaps in bathing are other etiological factors.

When the disease extends to the trunk and extremities, a red, thickened, and scaly skin is found—rarely crusting. The legs may become involved and the process extend over the whole body. The flexor surface of the body is usually involved rather than the extensor surface.

A prolonged attack will cause a loss in weight, due to the general undermining of the health of the patient. The itching causes nervousness and lack of sleep. Only in the most severe cases is there fever, and where there is intense intoxication there is probably a secondary invasion by bacteria.

I have seen several patients that had eczema in childhood, and who developed asthma in adult life.

The digestive tract is liable to be disturbed and diarrhea results. A condition often called simple impetigo is a form of eczema not

often seen. It affects the scalp and is a pustular eruption often extending over the whole scalp. This form of eczema is very resistant since it is pyogenic in origin and danger of reinfection is constant.

Symptoms.—There is always an intense itching or burning with the appearance of the eczema. On the cheeks it usually begins with "small red papules, later these coalesce and there is a moist red surface exuding serum or sero-pus." Children scratch and thus usually produce bloody streaks. The crusts have a yellowish-brown appearance. There is a redness, thickening, and always scaliness of the skin. The glands in the immediate neighborhood are usually swollen; they rarely lead to suppuration.

Eczema frequently spreads from the face to the forehead and the neck, and I have seen it involve the whole head.

Infant G. S., seven months old, was nursed about six weeks at his mother's breast. He was then fed on top milk and barley water. As this disagreed he was given barley water. He then had dyspeptic, greenish stools, and the feeding was changed to milk and rice water, which seemed to agree quite well. He gained steadily one-half pound every week for the next three months. He was at the seashore all summer and had no evidence of summer complaint. When seven months old he was slightly constipated and with it had dyspeptic fermentation. His appetite was poor. It was necessary to stimulate the bowels to produce proper evacuations. Teething appeared at about the eighth month. At the same time the child had a severe attack of influenza of the gastric type, with high fever, anorexia, and gastrointestinal atony. At this time a scaly and papular eczema appeared on one cheek and rapidly spread to both cheeks. With the application of a bland ointment consisting of zinc oxide and vaseline it disappeared. One week later I again saw this child with a relapse of high fever and dyspeptic symptoms, and a severe eczema covering an area larger than before. It was very red and angry looking and weeping in character. A gauze mask saturated with calamine and zinc lotion (3 per cent.) produced a marked improvement, besides relieving the itching. Internally I gave rhubarb and soda tablets in addition to cutting down the quantity of milk one-half of the previous strength. After three weeks of this form of treatment I was able to return to the former full milk feeding and the eczema did not return.

Diagnosis.—The diagnosis is easily made. The appearance of the rash on the face or scalp is characteristic.

Eczema on the body is more difficult to diagnose. Scabies and syphilis may be confused with it. Scabies can be differentiated, as a rule, by the fact that it rarely attacks the face and has a predilection for the webbing between the fingers and the skin around the

wrist and elbow joint. The characteristic burrows can be seen when examined with the hand lens.

A syphilitic eruption is generally copper colored. It appears upon the face and hands, sometimes on the legs, palms and soles. In contradistinction to eczema the eruption does not itch. The diagnosis of syphilis can be further substantiated by the presence of coryza and history of syphilis in the parents.

Treatment.—During an acute eczema all bathing should be stopped. Calamine lotion is very beneficial:

| | |
|-------------------------|-----------|
| R Pulv. calamini | 2 parts. |
| Pulv. zinci oxidi | 2 parts. |
| Glycerini | 1 part. |
| Aq. calcis | 30 parts. |

Calamine cream also gives good results.

| | |
|-------------------------|-----------|
| R Pulv. calamini | 5 parts. |
| Pulv. zinci oxidi | 5 parts. |
| Cold cream | 50 parts. |

Sig.: Apply with gauze three or four times a day.

To obtain a more rapid clearing up of the condition the lotion should be applied on a gauze mask or bandage kept constantly saturated.

Bathing should be discontinued for two weeks even after an eczema is cured. Many cases of eczema require bland unirritating applications, such as rice powder, zinc oxide, stearate of zinc, talcum, or cornstarch. They seem to act by absorbing the heat and moisture if any be present.

The following salves are suggested:

| | |
|--------------------|----------|
| R Zinc oxide | 2 drams. |
| Amyl | 2 drams. |
| Naphthalan | 1 ounce. |

Apply at night.

(JOHN FORDYCE.)

UNNA'S SOFT ZINC PASTE.

| | |
|-------------|-----------------------|
| R Ol. lini, | |
| Aq. calcis, | |
| Zinci ox., | |
| Cretæ | of each, equal parts. |

I have frequently found an apparently cured case of eczema break out anew with a red blush and eczematous patches after one ordinary cleansing bath was given. Soap should never be used.

When the eczema is hot, and has a crusty, scaly deposit, or when there is a marked exudation commonly termed "weeping eczema" with itching, excoriation and redness, relief can be afforded by giving a bland bath consisting of one pound of oatmeal tied in cheese-cloth, thoroughly soaked in hot water, and enough water added to bathe eczematous parts. After thorough soaking in this oatmeal bath the calamine and zinc or a 2 per cent. boric acid and vaseline ointment should be applied. *One bath only should be given.* The salve should be applied three times a day for at least one week. Irritating ointments, or those containing tar, should be avoided in the acute condition.

Intense itching can also be relieved by applying either of the following ointments:

SALICYLIC-SULPHUR PASTE.

| | |
|---------------------|-----------|
| ℞ Ac. salicyl. | 1 part. |
| Sulph. depur. | 5 parts. |
| Petrolati | 25 parts. |
| Zinci oxid. | 10 parts. |
| Amyli | 10 parts. |

ICHTHYOL OINTMENT.

| | |
|----------------------------------|-----------|
| ℞ Ammon. sulph. ichthyolat. | 5 parts. |
| Aq. dest. | 5 parts. |
| Adeps benzoat. | 15 parts. |
| Adeps lanæ | 25 parts. |

If sugar is being fed be it maltose, lactose or sucrose, it should be discontinued. If a top milk formula has been given, omit cream and thus reduce the fat. If the infant is well-nourished, lengthen the interval between feedings and shorten the period of nursing.

In an older child the diet should be reduced, and should consist chiefly of stewed fruits and green vegetables, together with a small amount of milk. To vary the monotony of the diet an occasional egg, cereal or chicken broth should be given.

Water should be given freely as diuresis is greatly to be desired.

If the bowels show a tendency to constipation the daily use of rhubarb and soda is indicated.

If the eczema is persistent, and the child's general condition suffers as a result, a systemic tonic such as iron or arsenic is indicated.

The systemic treatment in eczema is just as important as the local treatment. Attention to all of the above is necessary if good results are expected.

In chronic cases where it is desired to stimulate the skin, an irritating ointment, such as one containing tar or green soap may be applied. When a good reaction is obtained this medication should be stopped and the calamine and zinc lotion substituted.

ECZEMA INTERTRIGO.

This type of eczema occurs where two moist surfaces of skin are in contact such as between the thighs, genitals or buttocks, between the toes, or in the arm pits. It is characterized by a red eruption and the part affected is greatly inflamed. This may be accompanied by a foul smelling, generally serous, rarely purulent discharge.

This condition generally occurs in unclean children. The eruptive period occurs generally as the result of trauma over the unclean and moist areas. There is generally no crusting, and little or no itching.

Treatment.—Where the erythematous condition is due to filth, prompt cleanliness is desired. The calamine and zinc lotion and the stearate of zinc or boric acid dusting powder should be used. If possible the moist surfaces should be separated. This is best done by dusting with boric acid or stearate of zinc powders.

If the excoriation is very severe and not relieved by the calamine lotion, lead water may be tried.

SEBORRHEA (CRUSTA LACTA).

This is a very common condition of thick, dry, crusty formation which occurs on the head of infants. It most frequently involves the region surrounding the anterior fontanel. There are two varieties: (a) seborrhea oleosa; (b) seborrhea sicca. Some authors state that if the vernix caseosa in the newly born is allowed to continue, it passes into a seborrhea and may eventually become an eczema.

When carefully examined seborrhea will be found to consist of epithelial cells, fat, and chiefly dirt. There are no inflammatory symptoms. When the scales are removed the skin is usually found to be normal.

Treatment.—The following is recommended:—

| | |
|-------------------------|-------------------|
| R̄ Salicylic acid | 15 grains. |
| Vaselin | q. s. ad 1 ounce. |

Rub the scalp thoroughly several times a day and leave on overnight. Wash scalp with soap and warm water the following morning. If necessary repeat several evenings and wash in the morning as directed. Sulphur soap is useful in this condition. The official ointment of sulphur can be rubbed into the scalp if this condition recurs.

In many cases it will spread to the back of the scalp. Vigorous treatment is necessary. The following has been found of great value:

| | |
|----------------------|-------------|
| R Olive oil | ½ ounce. |
| Castor oil | ½ ounce. |
| Salicylic acid | 4 per cent. |

Rub thoroughly into the scalp night and morning until the crusts loosen, then wash them away with sulphur soap and warm water.

URTICARIA (HIVES; NETTLE RASH).

This inflammatory condition of the skin appears very suddenly. No special portion of the body is exempt; thus, it may occur on the face, abdomen, or extremities. It consists of irregular-shaped blotches called *wheals*. When these spots disappear they leave no trace behind. There are several varieties of urticaria.

Urticaria annularis occurs in rings.

Urticaria figurata occurs in spirals.

Urticaria vesiculosa has vesicles on the summit of the wheal.

Urticaria bullosa is a bullous development on summit of wheal.

Urticaria papulosa is a wheal combined with a papule.

Urticaria tuberosa are giant wheals.

Urticaria haemorrhagica is a combination of urticaria with purpura.

Urticaria pigmentosa is a pigmentation following the wheals.

The form most frequently met with in children is likely due to (a) food poisoning; (b) the result of some toxin in the system.

Etiology.—Susceptibility to some protein, in many children, gives rise to an urticaria. This is described under *anaphylaxis*. While some children are subject to the rash after eating cereals, eggs or fish, other children have urticaria after eating strawberries.

Some drugs such as quinine cause urticaria. The toxins of an insect bite will frequently cause urticaria, likewise the injection of diphtheria antitoxin. These are also known as serum rashes.

Symptoms.—There is severe itching, and scratching will frequently develop a new rash. Fever sometimes accompanies this

condition. Urticaria once seen is very easily recognized and is not hard to differentiate.

The prognosis is usually good. We must remember that children prone to idiosyncrasies will have urticaria quite frequently; thus, it will depend on the diet as to whether or no the rash remains away.

Treatment.—A subcutaneous injection of 2 to 4 minims of adrenalin chloride 1 to 2000 will stop the itching at once. Following this injection a teaspoonful of rhubarb and soda should be given every two hours. Sponging the skin with vinegar or alcohol will give relief. The following lotion is soothing:—

| | |
|------------------|------------|
| R Resorcin | 1 part. |
| Menthol | 1 part. |
| Phenol | 1 part. |
| Alcohol | 200 parts. |

M. Apply with cotton.

Large quantities of water should be given for thirst. It will also aid in eliminating toxins through the kidneys.

HERPES ZOSTER (SHINGLES).

This is an acute inflammation consisting of a group of vesicles. It is mostly seen over a surface of skin corresponding to a definite nerve tract. It is accompanied by neuralgic pain.

Symptoms.—An eruption of a papular or vesicular nature, very angry and red, with intense itching, is usually noted. There is a broad band of vesicles corresponding to the affected area, usually following a nerve tract along the limbs or along the borders of the ribs. A favorite location is the small of the back or the front of the chest. It spreads very rapidly so that we frequently have one-eighth to one-fourth of the entire surface of the back or chest involved. It develops very rapidly and frequently resembles an erythema. The crop of vesicles is frequently so thick that they almost touch one another.

Prognosis.—As this is a self-limited disease, the prognosis is good, although neuralgic pains may persist for some time after the disappearance of the eruption.

Treatment.—Avoid irritant salves and use cooling dusting powders, such as bismuth, cornstarch, wheat flour, or powdered zinc oxide. The affected part should be covered with linen or gauze, not flannel or wool. To allay intense itching or inflammation use calamine and zinc lotion (see chapter on Eczema).

IVY POISON.

Ivy-poisoning manifests itself by an intense inflammation of the skin, caused by contact with the poison-ivy plant. Some children are so susceptible to it that they need only come moderately near it to become infected.

The rash usually appears within a few hours after exposure. The skin becomes hot and red and develops a peculiar erythematous eruption, vesicular in character, resembling scarlet fever.

The temperature usually rises to 101° or 102° F. There is intense itching and swelling. When the face is the seat of infection, the edema of the eyelids frequently prevents opening of the eyes. Crusts form from the dried discharges of the vesicles. As a rule the acute condition lasts several days.

The prognosis is good.

Treatment.—Cooling lotions such as 10 per cent. calamine with zinc oxide applied locally, will relieve the itching. Fordyce recommends the following:

| | |
|----------------|-------|
| ℞ Phenol | 1.0 |
| Resorcin | 6.0 |
| Alcohol | 200.0 |

In some cases a tepid sulphur bath made by dissolving one-half pound of crude potassium sulphuret into five gallons of water, should be ordered. This may be repeated every three or four hours until the itching ceases.

During the acute stage of inflammation, all sugars, cereals, and starchy food, including potatoes, should be omitted from the diet. The diet should consist chiefly of milk, vegetables, fruits, bread, butter and cheese. For its laxative effect sour milk or Bulgarian milk is valuable.

CHLOASMA (TINEA VERSICOLOR; LIVER SPOTS).

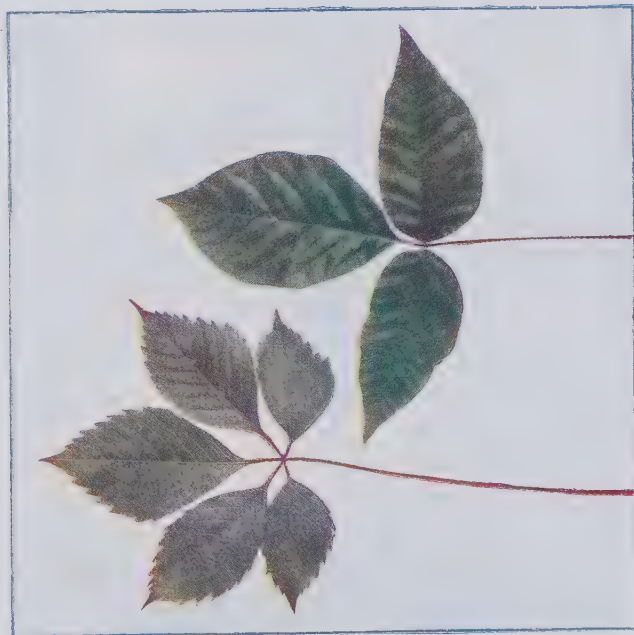
This is a mild form of eruption in which brown patches of skin are seen. It is caused by the invasion of a fungus.

Treatment.—The application of white precipitate ointment or 1 per cent. bichloride in alcohol has served me very well in removing the patches.

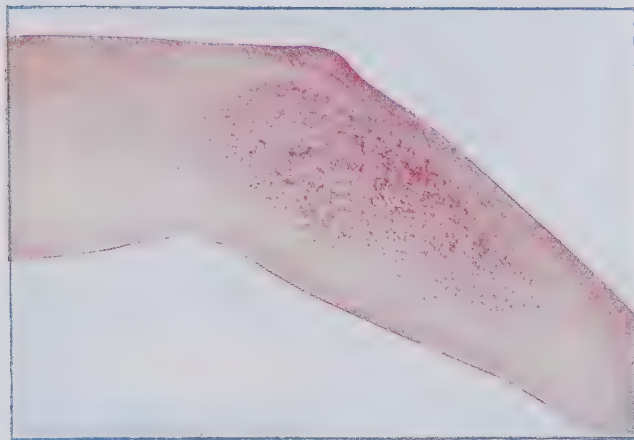
PSORIASIS.

This is a chronic inflammatory disease affecting chiefly the extensor surfaces. It consists of a red, scaly patch in which white, silvery scales abound.

PLATE LXXIV



Leaf of the Virginia creeper. A more slender leaf in clusters of five. The edges are more deeply notched than the ivy, the color is not as dark a green, and turns to red in the fall.



Ivy-poison. An intense inflammatory condition of the skin with an erythematous eruption, rose colored. It appears several hours after exposure. Intense itching and swelling are characteristic.

Etiology.—There is no specific factor, as it is found in both the rich and poor, although it frequently follows malnutrition of the body such as we see after the acute infectious diseases. This condition also frequently affects children of gouty parentage.

Symptoms.—The extensor surfaces are usually affected; hence the disease will be found on the extensor sides of the arms and legs. Elbows and knees are often the site of the lesion. The symmetrical arrangement of this eruption on both sides of the body is a characteristic condition.

Prognosis.—This should always be cautiously given. As the disease has a chronic tendency, it may remain for years.

Treatment.

℞ Chrysarobin 2 to 10 per cent.
Petrolatum 1 ounce.

or as a varnish

℞ Chrysarobin 2 to 10 per cent.
Liquid gutta percha or traumaticine 1 ounce.

℞ Salicylic acid 4 drams.
Chrysarobin 2 scruples.

Painted on daily, until reaction follows.

Do not use chrysarobin on the face or scalp owing to its destructive effect on the eyes and hair.

Whenever treatment is given, it must be continued until every spot has disappeared; otherwise the condition will relapse.

Heliotherapy and surf bathing have been found to be very beneficial. The best results are obtained with the x-ray. When cautiously given in measured doses the result is rapid and excellent. X-ray should not be used over a long period of time as permanent injury to the skin may result.

The following local applications are worth trying:

℞ Ammoniated mercury,
Salicylic acid āā 3ss.
Cold cream q. s. ad 3ij.

Cleanse the skin thoroughly with soap and water, then apply salve.

Auto serum has been tried without specific results.

Restorative treatment such as codliver-oil, iron, and arsenic should be given liberally. Arsenic need not be feared and can be

given to children in very large doses. Fowler's solution, in 3- to 10- drop doses three times a day, is usually sufficient.

IMPETIGO CONTAGIOSA.

This infectious and contagious disease is characterized by an eruption which may appear on any part of the body. It is most frequently seen on the exposed parts, usually on the face and hands.

Symptoms.—There may or may not be fever at the onset of the eruption. The eruption usually commences on the face and hands. It is easily communicated.

Treatment.—The white precipitate ointment 5 per cent., rarely 10 per cent., rubbed up with zinc oxide, if thoroughly applied at night will cure this condition. If, however, the white precipitate ointment is not available then a tub-bath consisting of kali sulphur (one ounce), dissolved in a porcelain or wooden tub full of water should be given. The temperature of this bath should be about 100° F., and the duration of the bath about five minutes. This bath should be repeated every night, before retiring, for one week.

PEDICULOSIS.

Pediculosis is of three kinds:—

1. Pediculosis capitis.
2. Pediculosis corporis.
3. Pediculosis pubis.

The first is the one most frequently encountered in children. It is caused by the invasion of the head louse.

The first symptom is often the appearance of scratch marks on the neck, and swollen glands. Unclean children are those most frequently affected, but as the disease is very contagious it is easily transmitted to clean children.

Upon examination, the hair will be found to contain nits which are small white, oval shaped masses firmly adherent to the hair, generally near the roots. From the scratching, eczema and then pustules may form and a pustular eczema develop behind the ear and on the back of the neck.

Treatment.—All the hair on the scalp should be removed, as the object of the treatment is to remove every single nit. If one remains the condition will recur. If it is not convenient to cut the hair the next best thing is to saturate the hair with a mixture of

PLATE LXXV



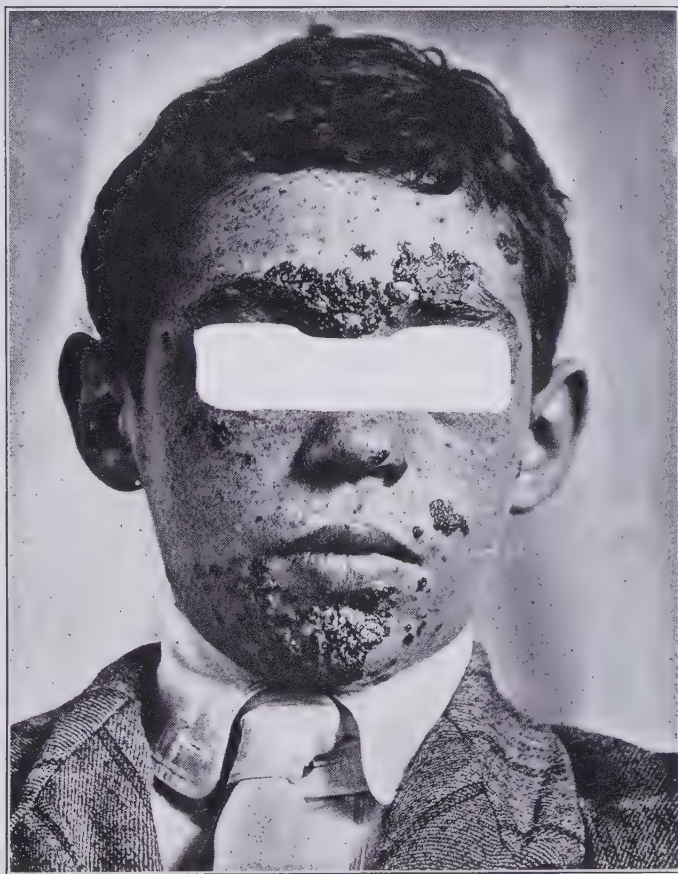
Impetigo contagiosa, six days duration, showing discrete and confluent lesions.

PLATE LXXVI



Impetigo circinata. This patient shows discrete and confluent lesions in crusted stage with annular configuration. (*John Fordyce.*)

PLATE LXXVII



Impetigo contagiosa, duration ten days, crusting stage has been reached with coalescence of lesions. (*John Fordyce.*)

sweet oil and kerosene and cover it with a towel. This should be kept on over night and firmly pinned. In the morning the head should be thoroughly shampooed and dried, then saturated with hot vinegar, and combed with a fine comb. Hot vinegar should be applied every night for a week. The acetic acid eats away the nits.

For pediculosis corporis the body should be thoroughly washed, and the clothes sterilized. This condition is infrequently found in children, and is easily cured.

Pediculosis pubis is similarly treated. The nits should also be looked for in the axilla and treated the same way.

MILIARIA PAPULOSA (LICHEN TROPICUS; PRICKLY HEAT).

This variety of skin disease is frequently seen in summer. It consists of bright-red papules on the summits of which there are very tiny vesicles; at times pustules may also be seen. The eruption is usually confined to those parts which are warmly clad, so that the abdomen, chest, and the extremities are most frequently covered. Eczema frequently follows this condition, and if severe scratching takes place, local infection ending in furunculosis may occur. The other parts of the body which do not have the eruption usually show extensive perspiration. This eruption comes and goes very quickly. It is frequently mistaken for scarlet fever. The absence of fever, the appearance of the tongue and throat, and the absence of the prodromal symptoms will easily differentiate this condition.

Treatment.—Rhubarb and soda or a dose of calomel should be given at the beginning. If the kidneys are inactive, then 10 to 20 drops of sweet spirits of niter should be given, and repeated two or three times a day. For the intense itching the application of a paste consisting of bicarbonate of soda and water will stop the itching. The body should be made comfortable by removing all warm clothing. A tepid alkaline bath; temperature 70° F.—a bath to which several ounces of bicarbonate of soda have been added—will give relief. After the bath, dry the body thoroughly and dust cornstarch or wheat flour with talcum or zinc oxide, and let the child sleep with as little clothing on as possible. If improvement does not follow within twenty-four hours, then the application of the following salve will relieve itching and reduce the inflammation:—

| | | |
|----|--------------------------|----------|
| R | Zinc oxide | 1 dram. |
| | Calamine | 1 dram. |
| | Cold cream | 1 ounce. |
| M. | Apply three times a day. | |

**MILIARIA RUBRA (STROPHULUS INFANTUM;
RED GUM).**

This rash is the result of an irritation due to perspiration. It consists of red papules, sometimes having tiny vesicles. It is usually seen on the cheeks of an infant and always upon the side on which the infant sleeps.

The treatment is the same as that for Miliaria Papulosa.

SUDAMINA.

Sudamina are small, pearly bodies occurring during fever or exhausting diseases. They are usually seen over the sweat ducts. They absorb themselves and require no treatment.

LENTIGO (FRECKLES).

This is a very common affection of the skin. It is usually seen in children over 5 years of age, and most especially in those having blonde or red hair. The skin is certainly more sensitive to sunlight in such cases, and successive crops of freckles frequently appear after exposure to the light.

The treatment consists in protecting the skin against exposure to the light. The freckles can be removed by a mild form of counter-irritation, such as the application of a 1 per cent. solution of bichloride of mercury. Apply on cotton to the affected area for three or four successive hours. This form of counter-irritation destroys the skin, causing it to desquamate. The new epidermis which appears is free from this pigment, but it generally reappears after a time.

FURUNCULOSIS (BOILS).

This inflammatory condition occurs around a hair follicle or a gland of the skin. It is most likely caused by scratching, during which process there is an infection of the follicle with pyogenic bacteria such as staphylococcus pyogenes aureus. Frequently we see boils scattered through the scalp in large crops. At other times they occur singly. A boil begins as a small, red spot in the true skin, very tender, and growing larger and larger. On palpation the center is soft and there is a tendency to suppuration. After suppuration has taken place, and the boil emptied, the swelling subsides. A furuncle is usually a small swelling; a carbuncle very large, frequently several inches in diameter.

The treatment of furunculosis is local as well as general. Thorough cleanliness of the skin is essential. Single furuncles can sometimes be aborted by the application of phenol. If there are many small furuncles the best way to treat them is to incise each when it points, and not before. The necrotic material should be expressed and if the abscess is of large size a bandage should be applied.

Staphylococcus vaccine in doses of 500 million daily for five or six injections is of benefit in some recurring cases. Autogenous vaccines are preferable to stock vaccines and if the latter do not benefit the condition then an autogenous vaccine can be made.

The general treatment is also essential. Carbohydrate ingestion should be reduced to a minimum. Iron or codliver oil may be given, especially in chronic cases.

ACNE.

Acne is characterized by inflammation of the sebaceous glands and manifests itself by pink pimples on the skin. It is caused by the acne bacillus. It is not generally seen in children until about the age of puberty, but cases do occur in younger children.

Predisposing causes are anemia and digestive disturbances. Symptoms of acne begin in a comedo or blackhead occurring in a pilosebaceous opening. The black is due to the thickened epidermis in addition to the dirt. These comedos must be expressed and prevented from going on through papule and pustule stages. It most often occurs on the face.

Treatment.—If the child is anemic, iron should be given. If constipation exists rhubarb and soda is of value. The local treatment consists in the use of compound white lotion (*lotio alba comp.*) If the acne is very severe a calamine lotion may be used at first, and this followed by *lotio alba*.

LOTIO ALBA COMPOUND.

℞ Precipitated sulphur,
Potassium sulphuretāā 1 dram
Zinc sulphate,
Aqua destillata or aqua rosaq. s. ad 4 ounces.
Sig.: Shake, and apply every three hours.

Or:—

℞ Potassium sulphuret,
Zinc sulphateāā 2 drams.
Alcohol 2 ounces.
Aqua rosaq. s. ad 4 ounces.
Sig.: Shake, and apply every three hours.

This prescription is of value in children with an especially oily skin.

CHRONIC PEMPHIGUS.¹

This frequently follows the acute condition. It resembles the acute disease in producing a succession of crops of bullæ.

The prognosis depends on the condition of the child at the time when it was first attacked. If the infant is underfed, and its vitality lowered thereby, then active restorative treatment should be instituted or the case will be lost.

Treatment.—The blebs should not be ruptured. They should be allowed to dry. The surface of the skin in the immediate neighborhood should be protected by a bland, non-irritating ointment, such as zinc salve.

Zinc oxide, borated talcum, or cornstarch powder should be used. If the bullæ rupture, the serum should be absorbed with a little cotton and the neighboring parts protected from the excoriating effect of the contents of the ruptured bullæ. Careful attention must be given to the stomach and bowels. If necessary, a mild laxative should be given. The diet should be regulated both as to quantity and quality.

NÆVUS.

There are two kinds of nævus usually seen: (a) pigmentary; (b) vascular. *Pigmentary* occur as small, rounded stains, which are either yellowish or dark brown. The cutis is raised, thickened, and frequently surrounded with a tuft of hair. They are most commonly seen on the face, neck, and hands.

Vascular nævi may be level with the skin or appear as tumors which project beyond it. The former is due to an excessive development of the capillaries of the skin. Commonly met with, it is of a purplish hue, although it may be brick-red, claret-red, or a livid-blue color. They are most commonly seen on the face and neck.

Treatment.—Blistering or caustics are recommended for the cure of this condition. I have frequently seen marked benefit from linear scarification by the Paquelin cautery. A radical operation should be considered if this milder form of treatment is unsuccessful.

¹ See article on Pemphigus Neonatorum.

TINEA TONSURANS (RINGWORM).

This disease is caused by the trichophyton tonsurans. When located on the scalp it is called herpes tonsurans; when on other parts of the body it is known as herpes circinatus.

Squire says: Under the microscope the stump of the hair appears ragged on either of its ends. Instead of breaking with a clean fracture, like healthy hair, the broken ends are digitated. The structure of the hair is greatly altered; its fibers are separated longitudinally, and the intervals filled with the spores of the trichophyton. On the surface of the hair are clusters of the same spores. The magnified piece of hair looks something like a bundle of faggots, with a number of berries sticking in clusters to its sides and ends, and stuffed here and there into its interstices. The spores of the trichophyton are rounded, have a well-defined outline, and measure about $\frac{1}{5000}$ inch across. In the earlier stages of the disease, when the hair has not yet become so brittle as to make it impossible to extract the root, it can be ascertained that the knob of the hair, as well as its root-sheath, is invaded by the spores of the trichophyton.

The disease commences with more or less itching and redness of some parts of the scalp; sometimes there is swelling. The hair growing on these patches loses its polish, and becomes dull. It is also brittle and easily breaks off near the root. This breaking off of the affected hairs gives the patch the appearance of having been lately shaved. There is a furfuraceous desquamation plainly seen on the scalp. The hair follicles become erect and the patch assumes a goose-skin appearance. The margin of the patch is abruptly defined. There are usually several patches seen on different portions of the scalp. If we attempt to pull out the hair stumps by means of a tweezer, we will note that only a portion of it comes away, leaving the hair root in the skin.

Treatment.—X-ray treatment was introduced by Sabouraud and Noire as a remedy that is promptly curative in ringworm of the scalp. Their method is based upon one measured application of this agent, sufficient to produce depilation, this latter ensuing two or three weeks after exposure, and without producing, at the most, more than the mildest x-ray erythema. Care must be exercised so that the slightest reaction is not exceeded; otherwise there is risk of permanent baldness. It is not a method to be used by those inexperienced in the use of the x-ray.

Full directions of this treatment can be found in Stelwagon's Diseases of the Skin.

The following method is also of value:—

Remove the superficial scales with the tincture of green soap, or by the use, for a day or two, of the pure green soap spread upon a piece of lint. Corrosive sublimate in 1 per cent. solution may be applied once a day, or the tincture of iodine, or carbolic acid in glycerine, 1 to 16, or the white precipitate ointment may be employed. I prefer the chrysarobin collodion painted over the patch every day or every other day. Kaposi's naphthol ointment is recommended by Lassar. Tar or sulphur ointments or Lassar's paste may be employed in obstinate cases.

Morris's thymol-chloroform oil is also beneficial.

MORRIS'S THYMOL-CHLOROFORM OIL.

| | |
|-------------------|-----------|
| ℞ Thymol | 1 part. |
| Chloroformi | 4 parts. |
| Ol. olivæ | 12 parts. |

Or:—

SUBLIMATE SPIRIT.

| | |
|------------------------------|------------|
| ℞ Hydrarg. chlor. corr. | 1 part. |
| Spts. vini rect. | 500 parts. |

Or:—

TANNIN-SULPHUR PASTE.

| | |
|-----------------------|-------------|
| ℞ Acidi tannici | 5 parts. |
| Lac. sulph. | 10 parts. |
| Petrolati | 50 parts. |
| Zinci oxidi | 17.5 parts. |
| Amyli | 17.5 parts. |

Or:—

CHRYSAROBIN COLLODION.

| | |
|------------------------|-----------|
| ℞ Chrysarobini | 1 part. |
| Collodii flexile | 10 parts. |

VERRUCA (WARTS).

These small tumors of the skin are frequently met with in children. They may resemble a bunch of carrots (*verruca digitata*) or they may resemble a cauliflower. In size they vary from one-sixteenth to one-eighth of an inch in height. They frequently are seen on the face, neck, and hands. They produce no discomfort and are not serious.

Treatment.—Freeze the parts with ethyl chloride or ether. Pick the wart with a sharp curette. Another painless method consists in cauterizing first with pure carbolic acid, on top of which

fuming nitric acid is applied. In using the latter caustic method, the surrounding parts should be protected with vaseline.

COMBUSTION (BURNS).

We frequently see burns of various degrees in children.

They are usually caused by hot water, steam, acids, or alkalies.

An intensely inflamed area surrounding a blistered surface is usually found. Pain and sometimes shock are noted. In some cases fever and a rapid increase in the pulse are noted. Violent reaction such as convulsions frequently occur in weak and rachitic children if a severe burn has taken place.

This depends upon the amount of surface involved and on the condition of the child at the time of the accident. Some children survive extensive burns with good care. As a rule a cautious prognosis should be given, owing to the risk of infection and danger of shock.

Treatment.—Strict asepsis should govern the opening of all blisters. Cornstarch, wheat flour, eucrophen, or dermatol may be used locally. In addition thereto, linseed-oil and lime water, or calamine and zinc lotion (see chapter on Eczema), is very valuable.

Air should be excluded by applying an ointment consisting of 10 per cent. ichthyol, 1 per cent. menthol, or $\frac{1}{2}$ per cent. phenol with vaseline. In some cases Fordyce advises the use of 1 per cent. picric acid ointment over which narrow strips of oiled silk are placed to prevent the dressings from adhering. Cover with sterile gauze and bandage.

GANGRENE (SUPERFICIAL GANGRENE).

This condition affecting the skin or extending to the deeper structures is characterized by a bluish-black discoloration resembling a deep form of cyanosis.

Causes.—It is a destructive condition following the acute infectious diseases, especially scarlet fever or measles. Traumatism or pressure interfering with the circulation of the blood or robbing the extremity of its nutrition may result in a destructive gangrene. The following case of traumatic gangrene occurred in my practice; it was a traumatic gangrene due to interference with the circulation:—

Baby A., ten months old, breast- and bottle- fed, was referred to me. I found a temperature of 105° F., pulse 180, respiration 60. There was

complete consolidation of one lobe of the left side. Bronchial breathing was plainly heard and there was dullness on percussion.

The diagnosis of lobar pneumonia was made. With the aid of cold packs and small doses of strychnine, the child's condition improved.

The nurse administered a high rectal enema by suspending the child with a towel around the thighs. The circulation was thereby interfered with. I believe the thrombosis, which appeared at about the saphenous

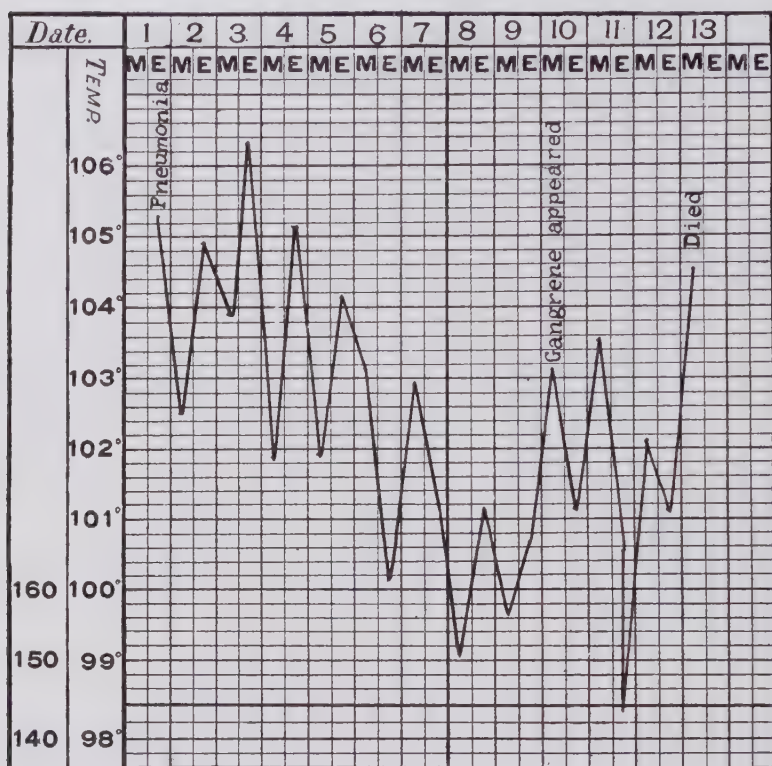


Fig. 274.—Case of gangrene following lobar pneumonia. Gangrene appeared on the tenth day of disease, due to a careless method of suspending the child by a towel around the thighs, which resulted in thrombosis, ending fatally.

opening, was of traumatic origin due to this interference of the circulation. The course of the gangrene was as follows: A bluish-purple spot about the size of a ten-cent piece appeared at the saphenous opening. The child previous to this showed indications of pain. It was fretful, tossing about, and very restless. The gangrenous area increased on the following day. It was decided to wait for a line of demarcation, as the child appeared to be in a state of collapse. On the third day after the first sign of

gangrene appeared, a rapid spreading took place upward along Poupart's ligament and continued above and involved the umbilicus.

When I again saw this case the gangrene involved the whole abdomen. The temperature was 102° F., the pulse very feeble, and the child in a state of collapse. It was necessary to stimulate and feed per rectum. The child died in convulsions.

Prognosis.—The prognosis is always bad, although surgery may be the means of amputating a gangrenous extremity and saving the rest of the body.

Treatment.—There is no medicinal treatment worth trying. Surgical relief is our only hope.

SCABIES.

This is a contagious disease caused by the female acarus burrowing into the skin. The characteristic features of this disease are that it is found between the fingers, in the axillæ, on the flexor surfaces of the wrists, and also around the genitals. The eruption is either a papule or a vesicle, sometimes a pustule. There is an intense itching, and secondary infection results from scratching. Several children in the same family will usually be found so affected.

The prognosis is always good.

Treatment.—A hot bath, to thoroughly soak the body and soften the epithelial scales, should be ordered. An inunction of 10 per cent. unguentum hydrarg. ammon. should follow the bath. Sulphur soap may be used in addition to sulphur ointment if no benefit results from the foregoing treatment.

White precipitated sulphur sprinkled between the sheets at night affords relief.

An excellent method advised by Fordyce is, first, a cleansing bath, followed by applications of the following:—

| | |
|---------------------|------------|
| ℞ Balsam Peru | 1 dram. |
| Sulphur | ½ dram. |
| Betanaphthol | 10 grains. |
| Petrolatum | 1 ounce. |

M. Sig.: Apply on affected areas. Repeat treatment three successive nights.

Strict supervision must be kept for at least ten days.

IV.

MALIGNANT AND NON-MALIGNANT GROWTHS.¹

ABNORMAL growths are frequently seen in children. Some of these are malignant, while some are benign. We must not suppose that children do not have malignant disease. I have seen malignant sarcoma involving the whole of the left lung which crowded the heart into the right axillary space.

SPINDLE-CELL SARCOMA OF THE THORAX.

Gustav L., 8 years old, was seen by me with the following history:—

He was breast-fed about ten weeks and owing to a diminution in the quantity of the mother's milk, she was forced to wean the child. He then received sterilized milk. This food was given until the child was weaned from the bottle at about the end of his second year.

When about 6 months of age, a large, glandular swelling commenced behind the right ear, which necessitated an incision. The attending physician said it was an abscess. At this same time, he had a severe attack of gastric fever. This required careful dietetic treatment. Cows' milk was continued in a more modified form.

At age of 1 year the child was attacked with measles, accompanied by a catarrhal bronchitis. Some cough remained and when the child was 2 years old he had a severe attack of pertussis. When the child recovered, he remained well until he was 3½ years old, then he was infected with scarlet fever lasting two months. Thus the child passed his infancy with some gastric derangement, followed by measles, pertussis, and scarlet fever. He did not have croup or diphtheria.

Family History.—This is good. The parents of this patient are both living, and apparently strong and healthy; they have two other boys, well and strong. There is no history of syphilis, rheumatism, gout, tuberculosis, epilepsy, nor anything of a malignant nature in the family, excepting this fact which is extremely noteworthy, that the grandfather had a sarcomatous tumor, which ended fatally.

Examination.—The patient was brought to me for the relief of a number of tumors on the front of the thorax, which felt quite hard on palpation. At times a distinct sense of fluctuation could be made out, and when examined by an exploratory puncture, a few drops of thin, yellowish serum was obtained. These tumors have been very troublesome for the past few years. They have caused severe dyspnea. The physician who treated this boy in Hamburg believed that the growths contained pus. This statement

¹ For complete list surgical works should be consulted.

was made to the family. The physician made an exploratory puncture and obtained a few drops of thin, serous liquid.

The size of the growth as seen externally was about 15 centimeters in length and about 6 to 7 centimeters in circumference. (See Fig. 275.) There was marked dullness on percussion extending over most of the left side. The tumor was surrounded by a network of veins, intensely engorged with blood. There was mediastinal pressure. As far as could be seen and pal-



Fig. 275.—Spindle-cell sarcoma. The prominence of the tumor shows by contrast the emaciation of the body.

pated, the growth occupied that region of the thorax *usually occupied by the heart*. The growth varied in size from week to week.

The heart had been pushed to the right side and occupied the right axilla. The apex beat was heard about two finger breadths below and to the right of the *right nipple*. (See Fig. 276.)

The pulse was 144, small, feeble, quite irregular and easily compressible. The respiration was irregular, of the Cheyne-Stokes type, and frequently sighing. It was usually about 50-52 in a minute; the temperature was always above normal and varied from 100 ° F. in the rectum, morning, to 101½ ° F. in the evening. There was always a febrile tendency.

There was constant dyspnea and also extreme cyanosis of the lips, fingers and toes. The child was very pale and in a very anemic condition. There was extreme pallor of the conjunctival membrane, the gums, and the mucous membrane of the lips.

Owing to the extreme amount of weakness caused by anorexia, the



Fig. 276.—Anterior view of the tumor. Showing also the position of the displaced heart and the enlarged veins.

child was compelled to remain in bed most of the time for the last year. Dyspnea was so great that the child slept in a sitting posture. The child was very nervous and trembled when he was touched. He was very bright mentally. There was constant and rapid emaciation. Concentrated food was given, which the patient took quite well. There was extreme hyperesthesia of the skin. The digestion was quite good, and although the bowels moved sluggishly, they did not require much medicinal treatment.

Fruit and fruit juices acted as laxatives. There was a curvature of the spine from left to right, most marked in the dorsal vertebra. The urine was examined several times. It showed no evidence of pus or blood, no albumin and no sugar. There was a slight indican reaction. No acetone, no casts, no morphotic elements, microscopically.

The case was hopeless from a medical standpoint, as the growth was constantly increasing. The child suffered constantly from insomnia and great dyspnea, requiring constant soporifics and narcotics. In spite of the grave prognosis, the family hoped that surgical measures might afford some relief.

As the tumor frequently appeared to show a distinct pointing, this latter condition suggesting fluid, an anesthetic was given. The anesthetic was badly borne and I succeeded with difficulty in making two exploratory punctures.

An x-ray examination, to verify the clinical data was made. The heart could be plainly seen pulsating on the right side. No definite satisfactory data could be learned concerning the tumor, on account of the restlessness of the patient, and the child was removed to St. Mark's Hospital and operated. The child died soon after the operation.

A specimen of the tumor, removed during the operation, was sent for a pathologic examination. The tumor was reported to be a spindle-cell sarcoma in a rather active state of growth, on account of the large number of mitoses present. The fluid contained simply red blood cells and no pus.

Sarcomatous growths in children are quite rare, though met with from time to time. Thus Mauderli, in the Children's Hospital of Basle, Switzerland, reports for the last twenty years that he treated a total of ten patients: 7 boys and 3 girls, of whom 4 were under 3 years of age, 3 were between 3 and 6 years, 1 was between 6 and 9 years, and 2 were between 9 and 12 years.

As but one case of malignant sarcoma was met with in this hospital in the course of the last twenty years in children as old as the case here reported by me, I feel justified in adding mine to those already recorded.

The interesting points about my case were: (1) The displaced heart, the heart being immediately behind the right nipple. The pulsations and apex-beat could be distinctly felt and seen about two finger-breadths below the right nipple. (2) The intense dyspnea caused by pressure of the tumor. (3) Constant cyanosis and edema of the limbs, due to interference with the return circulation to the right side of the heart.

CARCINOMA.

Carcinoma is occasionally found in children. Malignant growths of this kind have been diagnosed and verified by microscopical examination.

HYPERNEPHROMA.

Literature records many cases of hypernephroma in children. The following case¹ was seen by me in a boy 16 years of age: The case was brought to me with a history of hematuria. The bloody urine was noticed several weeks, and was probably due to injury caused by carrying some boxes, while working on a farm. No apparent discomfort or pain was evidenced for many weeks, when a small swelling developed over the region of the spleen. Subjective symptoms, such as pain, were described and there was a slight rise in temperature. The swelling increased from day to day. A radiogram was taken. The diagnosis of tumor was made and the patient was operated. The tumor was removed and proved to be a hypernephroma. Radiograms of the long and flat bones revealed a series of tumors in the spine, scapula, and femora.

The patient died of emaciation and exhaustion within a year.

LIPOMA.

Fatty growths are occasionally seen in children. They occur on the scalp, on the back, and I have seen them on the buttocks. They require the same treatment as fatty growths in adults. (See article in the section on Newly Born Baby on Congenital Sacral Tumor.)

ENCHONDROMATA.

These hard growths are usually found on the fingers and toes. They are found in the neighborhood of the joints, with which they are closely allied. A case of this kind which had several tumors removed occurred in my practice:—

Mary B., 10 years old.

Family History.—Father healthy. Mother died of carcinoma of the uterus. Has one sister, who is healthy and married.

Patient's History.—Was breast-fed during infancy. Suffered with no gastric or enteric disorders. Had measles when several years old. Is not

¹ For complete clinical history of this case see *Archives of Pediatrics*, November, 1914.

subject to any chronic disease. Her extremities are normal excepting the affected hand. The mother stated the tumors had been present soon after birth. They were not painful, nor did they cause discomfort, so nothing was done until the child reached this age. The case was referred by me to the surgeon who removed the growths. The case made a perfect recovery.

SPINA BIFIDA.

Abnormal growths are frequently found in the lumbar region associated with the spinal cord. They are frequently seen in cases of hydrocephalus. A case of spina bifida is reported in the chapter on Malformations of the Spine.



Fig. 277.—Enchondromata involving the thumb and index finger.

ANGIOMATA.

Angioma.—Large vascular growths are occasionally seen in children. A case of this kind was seen by me, which I described in the chapter on the Newly Born Baby, page 220.

PAPILLOMATA.

This growth is occasionally seen in the larynx of infants and children. It may be congenital. When growths recur we should suspect systemic disease. A Wassermann test should be made to exclude syphilis.

Symptoms.—Marked dyspnea is usually a prominent symptom. This dyspnea increases with the enlargement of the

growth. There is also a husky voice, which increases in severity. The symptoms are very marked at night, but are much less, and frequently disappear entirely, during the day. Cough may also be present, but no expectoration. There is no fever. The diagnosis is usually made by a laryngoscopic examination. When the same symptoms appear for weeks and months, a laryngeal growth should be suspected.

Treatment.—Removal of the growth with an anesthetic is absolutely necessary. The danger in removing the growth should always be borne in mind; hence the surgeon should be prepared to perform a tracheotomy if necessary. Intubation of the larynx will relieve the difficult breathing; at the same time there is danger of pushing some of this growth with the tube, thus obstructing the caliber of the same. Relapses are common.

GRANULOMATA.¹

These growths are frequently seen at the site of the wound following a tracheotomy. They resemble a mass of exuberant granulations.

A. Rosenberg, of Berlin, collected 231 cases of laryngeal tumors in children. Some of them were subjected to tracheotomy; others received endolaryngeal treatment preceded by tracheotomy. In another series of cases persistent endolaryngeal treatment was resorted to without performing tracheotomy. This latter method yielded the better results.

¹ In Part III, page 191, will be found article on Granuloma.

PART XI.

Diseases of the Spine and Joints.

POTT'S DISEASE.¹

THIS disease derives its name from Percival Pott, who described it in 1779. It is a chronic destructive process which begins in the bodies of the vertebræ. The bodies of the vertebræ support the weight of the body. As the disease progresses the weakened parts give way, and the upper segment inclines forward. An angular posterior projection, *kyphosis*, is formed which is the characteristic deformity of the disease.

Etiology.—Pott's disease may appear at any period of life, from earliest infancy to old age, but like all forms of tuberculosis of the bones, it is most common in the first ten years of life, and 50 per cent. of the cases begin between the ages of 3 and 5 years, inclusive.

The lower segment of the spine, including the dorso-lumbar region, is most often involved. Cervical disease is relatively infrequent (cervical, $7\frac{1}{2}$ per cent.; dorsal, 68 per cent.; lumbar, 24 per cent.). The death rate is at least 25 per cent. The course of the disease is most protracted in the middle region; it is shortest in the cervical region, its duration varying in favorable cases from two to five years.

When the local resistance overcomes the tendency to degeneration, the process of repair begins. The tuberculous products are absorbed or enclosed, and ankylosis between the two segments of the spine is established by means of a union, in part fibrous, cartilaginous, and bony. Firm union is long delayed, and the deformity may increase long after the disease has become inactive (Whitman).

Pathology and Bacteriology.—The first indications of disease are most often found beneath the fibro-periosteal layer of the anterior longitudinal ligament. From this point the granula-

¹ The table of differential points between Pott's Disease and Rickets will be found on page 372.

tion tissue advances along the course of the blood-vessels into the adjacent bone, extending from one to another until several bodies are more or less involved. The disease is accompanied, in many instances, by an abscess, which may be of sufficient size to cause special symptoms; or the tuberculous process may find its way to the posterior part of the vertebral bodies and thus involve the spinal cord, causing paralysis. Abscess is most common as a complication of disease of the lower part of the spine,

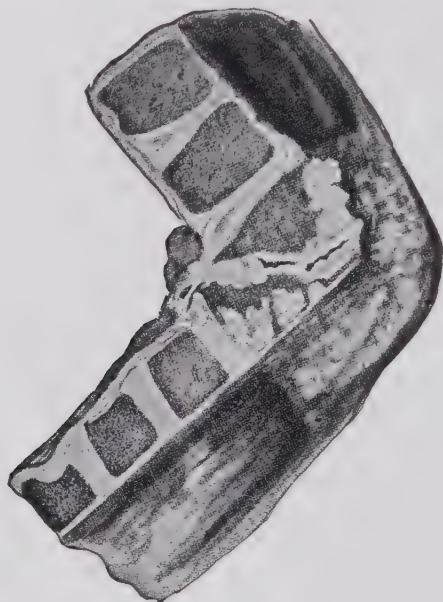


Fig. 278.—Pott's disease (Langerhans). Kyphosis of dorsal vertebræ the result of caseous tuberculous periostitis and osteomyelitis. Destruction of three thoracic vertebræ. Two-thirds natural size.

where it may be detected in at least 50 per cent. of the cases. Paralysis most often complicates disease of the upper dorsal region, appearing in about 10 per cent. of the cases in which this part of the spine is involved. The primary infection is no doubt due to the entrance of the tubercle bacillus.

Anatomical Landmarks.—The atlas is on a line with the hard palate. The axis is on a line with the free edge of the upper teeth. The transverse process of the atlas is just below and in front of the tip of the mastoid process. The hyoid bone is opposite the fourth cervical vertebra.

The cricoid cartilage is on a line with the sixth cervical vertebra.

The upper margin of the sternum is opposite the disc between the second and third dorsal vertebræ.

The junction of the first and second sections of the sternum is opposite the fourth dorsal vertebra.

The tip of the ensiform cartilage is opposite the lower part of the body of the tenth dorsal vertebra.

The anterior extremity of the first rib is on a line with the fourth rib at the spine, the second with the sixth, the fifth with the ninth, the seventh with the eleventh.

The scapula covers the second and the seventh ribs, its lower angle being opposite the center of the eighth dorsal vertebra.

The root of the spine of the scapula, the glenoid cavity, and the interval between the second and third dorsal spines are in the same plane.

The most constant landmark from which to count is the spinous process of the fourth lumbar vertebra, which is on a line with the highest point of the crest of the ilium. The umbilicus is near the same plane.

The tip of the coccyx is opposite the lower border of the symphysis pubis.

Symptoms.—If the upper part of the spine is affected, a stiffness of the neck usually exists. If the lower part of the spine is affected, limping will be noticed, hence awkwardness in walking in very anemic children should always be looked upon as suspicious.

The limitation of motion due to muscular spasm, to pain, and to the local disease is an important factor in diagnosis. This, together with the deformity, may be demonstrated by bending the patient's body directly forward to the fullest extent. An object is next placed on the floor, and the patient is directed to pick it up. If this is done awkwardly by squatting or kneeling, it demonstrates weakness and stiffness. The patient should next be placed prone upon a table, and the surgeon should test the flexibility of the spine by lifting the legs and swaying the body from side to side. The range of extension at the hips may be tested at this time by holding the pelvis against the table with one hand, while the thigh is over-extended with the other. This is the test for the slight degree of psoas contraction that is often present on one or both sides in disease of the lower region.

The flexibility of the upper part of the spine may be tested by voluntary and passive movements of the head in various directions, and the range of motion of the occipito-atlo-axoid joints by holding the neck while the patient nods and turns the head from side to side.

The character and the extent of the deformity, if it be present, should next be investigated. Note the contour of the spine. Any changes from the normal are, in childhood, suspicious circumstances. Note the elasticity of the spine. If when the child is bent forward the spine forms a long, regular, even curve, disease is unlikely. If there be a break in the outline, and if one part remains rigid and another bends, disease may be suspected.

Pott's disease in the lower region of the spine presents the following characteristics:—

1. *Pain*.—The pain is referred to the lower part of the abdomen, to the genitals, to the loins, or to the thighs.

2. *Gait*.—The waddling gait which has been described under general symptomatology is characteristic of disease in this region. In some cases there is a limp.

3. *Attitude*.—Usually an abnormal erectness and sometimes an exaggerated lordosis; in some instances a lateral inclination of the body. Unilateral psoas contraction and the attendant limp are often present.

4. *Stiffness*.—Muscular rigidity of the lumbar region interferes directly with almost every attitude and movement. The effect of this stiffness and of the accompanying weakness may be demonstrated by the popular method of asking the child to pick up a coin from the floor. In this region of the spine the symptoms are usually well marked before the stage of deformity, flexion of the legs, the effect of psoas contraction, and abscess are present in perhaps a third of the cases.

Pott's disease of the middle region is characterized by the following peculiarities:—

1. *Pain* is referred to the lateral region of the thorax or to the front of the body. It is a common symptom. It is noted after sudden movements or after compressing the chest, as when the child is suddenly lifted from the floor.

2. *Respiration*.—If the disease is at all active, a grunting respiration is usually present, especially after exertion. This is the most characteristic of all symptoms, especially so in young subjects.

3. *Attitude*.—This is not always distinctive, but usually there is a peculiar shrugging squareness of the shoulders; occasionally a lateral inclination of the body. The head is often inclined backward. The neck seems short on account of the elevation of shoulders.

4. *Deformity*.—The deformity is usually prominent and it appears early in the disease.

5. *Complications*.—The most common complication of dorsal disease is paralysis, abscess being less frequent than in the lumbar region. Flat chest and chicken breast may be secondary deformities.

Pott's disease of the upper region presents the following peculiarities:—

1. If the uppermost cervical vertebræ are diseased, the *pain* is referred to the head, particularly to its lateral and posterior aspects. In disease of the middle cervical region it is referred to the neck, or to the shoulders or chest.

2. The *weakness* and *stiffness* are manifest by the *attitude*. The head cannot be turned freely. If the disease be in the occipito-axoid region, the nodding and rotary motions are restricted. The chin is often depressed and slightly turned to one side. Lateral distortion resembling torticollis usually occurs when disease is nearer the middle of the cervical region.

3. The bony *deformity* is often slight or absent, but thickening of the tissues about the spine and local sensitiveness to lateral pressure are usually present. Retro-pharyngeal abscess is not uncommon when the atlo-axoid region is involved.

Complications.—(a) *Abscess*; (b) *Paralysis*: About 25 per cent. of all cases have abscess. An abscess situated in the atlo-axoid region often burrows into the retro-pharyngeal space. It may involve the cranial cavity when this occurs; symptoms of meningitis will be noticed. When an abscess forms from disease of the middle cranial region it usually opens on the side of the neck, before or behind the sterno-cleido mastoid region. When abscess follows disease in the dorsal region it burrows through the thorax. It can be detected by the physical signs accompanying pain (see chapter on Empyema).

When it burrows downward it may give rise to an iliac or lumbar abscess. In disease of the lumbar region, the abscess, if superficial to the ilio-psoas muscle, may point in the neighborhood of the anterior superior spine, or pass through the inguinal

ring. The true psoas abscess first distends the iliac region, and then passing into the thigh, appears in Scarpa's space. In large abscesses of this character the pus may find an exit in the loin at the triangle of Petit, or in the gluteal region through the sacrosciatic foramen.

In rare instances the abscess may find an opening within the body, and burst into the lungs, the intestines, or elsewhere.

As a rule abscess causes but little difficulty in diagnosis, because it is a late symptom, appearing after the diagnosis of Pott's disease has been established. It is more often an early symptom in the upper and lower regions of the spine, but in any event it is always accompanied by symptoms of the underlying disease of the spine.

Paralysis.—The symptoms of Pott's paralysis are an awkward stumbling gait, weakness, and finally an inability to stand. The lower limbs are "stiff" at times. The reflexes are increased. Control of the bladder may be retained, but often there is active incontinence; that is, the bladder empties itself from time to time. If the pressure is directly upon the reflex centers in the lumbar enlargement, there may be passive incontinence or dribbling of urine. If the pressure is below the reflex centers, the bladder is not affected, and the symptoms of numbness and weakness resemble those caused by neuritis.

Differential points concerning abscess:—

1. Abscess of the cervical region must not be confounded with the symptoms of enlarged tonsils, adenoids, or with so-called croup. It must also be distinguished from the simple acute abscesses of this region.

2. Abscess of the thoracic region is to be distinguished from those secondary to disease of the lung or of the chest wall.

3. Abscess in the loin or inguinal region may be mistaken for the acute or chronic abscess due to:—

- | | | |
|------------------------------|---|--|
| (a) Perinephritis. | { | These are usually of acute onset and are accompanied by constitutional disturbances. |
| (b) Perityphlitis. | | |
| | { | There may be secondary rigidity of the spine, but no deformity, as is usual in Pott's disease at the stage of abscess formation. |
| (c) Sacral or iliac disease. | | |
| (d) Hernia. | | The symptoms of Pott's disease are lacking. |

The *paralysis* of Pott's disease must be distinguished from

1. Simple weakness.
2. Injury to the cord.
3. Tumors of the cord.
4. Syphilitic disease of the cord.

The *weakness and stiffness* caused by Pott's disease in the lower region may be simulated by lumbago, rheumatism, sciatica, and



Fig. 279.—Pott's disease. Case of Harry F.

by the effect of injury or strain. Lumbago, rheumatism, and sciatica are uncommon in childhood. They are usually of sudden onset. Sciatica is usually unilateral; the pain of Pott's disease is usually bilateral. Strains and other injuries have, as a rule, a well-defined history.

Prognosis.—This should be cautiously given. While most cases seen by me ended fatally, several cases improved and recovered entirely. Years of patient treatment are necessary, and occasionally the most severe cases may end in recovery.

Harry F., 4 years old.

Family History.—Father and mother are unhealthy, weak and very poor. One child has died of summer complaint. Another, two years younger, is inclined to cough, and was operated by me for empyema.

Personal History.—The child was born and has since then lived in a tenement house, in a densely populated section of the city. He was a bottle-fed infant, and has been constipated since birth, although he suffers with diarrhea in summer. Has always been a frail and sensitive child. Has had measles and bronchitis, and is constantly troubled with some catarrhal affection. The child was late in walking, late in talking, and late in dentition. The general development shows backwardness when compared with a normal child. A slight deformity of the spine was first noticed when the child was about 2 years old. It has increased in prominence since that time. There is no distinct evidence of tuberculosis that can be made out in the lungs. The glands are not enlarged, there is no cough or expectoration. No evidence of fever.

The treatment consisted in giving codliver oil and creosotal internally from 2 to 5 drops, three times a day. Friction of the body and general hygienic measures were instituted. Great stress was laid on the nourishment of the body. Cream, butter, eggs, cereals, and vegetables have been given constantly.

Orthopedic Treatment.—For the relief of the deformity, a supporting brace fitted to the body like a corset, similar to a Bradford frame, had been used for over six months with little improvement, therefore the case was sent to Ashley for a plaster-of-Paris corset. This treatment has been very successful, and the child is progressing favorably.

Treatment.—The modern conception of treatment in this disease is to use restorative measures. Nothing equals thorough oxygenation of the lungs for which a rigid out-door life should be maintained. A sleeping-porch facing south or south-west will insure plenty of oxygen and thorough rest. By this means we can stimulate metabolism, strengthen the appetite, and aid nature in rebuilding new bone. Sunshine is a valuable tonic, and sun baths given at an altitude possess decided advantage. Heliotherapy is very successful in sanatoria because of the maximum amount of pure air, sunlight and food ordered.

As a rule, drugs, with the exception of phosphorized codliver oil are useless. Bathing and hydrotherapy aided by massage will stimulate the circulation and is to be recommended daily. When pus is present nothing but surgical treatment should be considered. Surgical treatment is not always necessary. The majority of cases require support by means of (a) spinal splint; (b) spinal brace; (c) plaster jacket.

Either of these must be properly applied by a competent surgeon. I have seen some very disagreeable accidents due to a too tight corset. For details in connection with the application of braces or plaster jackets the reader is referred to text-books on orthopedic surgery.

FLATFOOT.

Children are not born flatfooted. Very heavy children are pre-disposed to flatfoot, especially if rickets is present. Laxity of the knees is usually found associated with this condition.

Opinions expressed by Whitman, Frauenthal, and Lorenz, combined with personal experience, have been utilized in the preparation of this article.

Etiology.—In children, as in adults, flatfoot, so-called, occurs quite frequently and may be due to the following: to relaxed condition of the muscles, letting down the longitudinal arch; to the weight of the child; it may be secondary to measles, scarlet fever, diphtheria, infantile paralysis, etc.; or it may be due to malnutrition as in rickets and similar systemic disorders.

Treatment.—While shoes are of some aid, recovery is dependent on the re-education of the weaker muscles so that they will properly develop support to the arch of the foot, and it is this type of care that brings about a permanent result.

Arch supports of steel should never be used. A proper support can be made out of felt pad which has a spring to its consistency and should only be regarded as a temporary support.

One must realize that metal supports traumatise the periosteum very often and do considerable damage to the child's foot.

It should not be the intention of the physician to supply metal arch supports which would really be in the nature of a permanent crutch but they should bend their efforts to the re-education of the weaker muscles which sustain the arch of the foot. Exercises can be taught the child with little difficulty.

One of the more valuable exercises for the correction of flatfoot is one in which the child raises itself on its toes after the toes and heels have been placed together flat on the floor. After rising on the toes the heels are slowly allowed to drop toward the floor, but not to touch it. The exercise is then repeated with the child alternately rising on the toes, and dropping until the heels do not quite touch the ground. The length of time that the child does this can be gradually lengthened as the muscles become stronger, and will be accomplished with less fatigue.

Shoes with a raised inner border which will help in strengthening the peronei are of value when combined with the above exercises. The shoes should not be worn permanently; only during the period of re-education of the muscles.

Another very valuable exercise is one in which the medial border of the foot is raised after the toes and heels have been properly aligned. The movement consists in alternately raising and lowering the inner border of both feet. This exercise strengthens the evertors of the foot, and aids in maintaining the convex inner border of a normal foot. The former exercise strengthens the peronei, and the tibialis anterior and posterior, all of which aid in maintaining the longitudinal arch.

SPINAL CURVATURE.

The spine of a newly born infant is almost straight, but from the time the child begins to walk erect, curvatures arise in the direction forward and backward which are normal and physiological, *viz.*, a curvature with the convexity forward in the region of the neck, backward in the dorsal region and forward in the lumbar region.

KYPHOSIS.

Kyphosis is also known as round-back. It is an increase in the normal curvature in the dorsal region of the spine. It is a non-inflammatory condition and is amenable to treatment. The increase in the curvature backward is called round-back, kyphosis arcuata, increase in the curvature forward, saddle-back, lordosis. The cause is usually faulty position assumed at school or at home, and associated therewith weakness of both muscles and bones.

I have elsewhere in the article on Rachitis, also in the article on Pott's disease, described this condition.

The treatment depends on the cause. If it is due to rachitis, restorative treatment is indicated. Iron, hypophosphites of lime and soda, and codliver oil are the drugs to be given. In addition to drug treatment, fresh air and out-door life must be given before gymnastic exercises are considered. Deep breathing with arms raised and extended forward and backward, in a cool room, should be a daily routine. The exercises should not be carried to a point of exhaustion; usually ten to fifteen minutes is sufficient to produce a good reaction.

If the kyphosis is due to tuberculosis of the spine an open-air life should be recommended. The treatment of tuberculosis in general applies very forcibly to Pott's disease, but we must remember that, be the kyphosis due to an atony of the muscles or to a general systemic weakness such as rachitis, such cases will relapse unless the daily exercise is continued.

SCOLIOSIS.

Every permanent deviation to the side, in the spine, is called *lateral curvature* or *scoliosis*, and is the form most commonly met with of all deformities of the spine.

Scoliosis may be called cervical, dorsal, or lumbar scoliosis, depending upon which part of the back is bent. The curvature may include only a few vertebræ, or the spine in its entirety. Two or more curvatures may simultaneously be found in the same person. Scoliosis can, further, be right-sided or left-sided, according to the convexity of the lateral curvature.

Scoliosis has a pretty constant course. Although no exact limit can be fixed, scoliosis may be suitably divided, from a symptomatological point of view, into three degrees of development. The slightest forms of scoliosis can develop into the most severe: it is impossible, however, in every case to foretell whether a scoliosis will be stationary at a certain stage or whether it will further develop itself.

A *scoliosis of the first degree* may, to the unpractised, be difficult to detect, as no clear curvature of the spine can be observed. The existence of the scoliosis is characterized by a slightly forward arching or bulging-out of the lateral contour in the region of the chest. Scoliosis of the first degree is noted whenever the patient takes a standing or sitting position, but it disappears in a hanging or lying position. A scoliosis of the second degree can also disappear, as long as the patient takes certain positions or performs certain movements which counteract the form of scoliosis in question; pressure on the convexity of the curvature may also bring the spine back to a straight position. A scoliosis of the first degree is called *simple*, *primary*, or *C-formed*. Generally the primary scoliosis appears as a right-convex dorsal scoliosis or as a left-convex lumbar scoliosis.

A *scoliosis of the second degree* arises in the following manner: that to the primary curvature, after a time, another unites itself—

a secondary, compensatory or so-called anti-curvature; in consequence of this formation the scoliosis has become *S-formed*. A scoliosis of the second degree differs also from one of the first degree in that the curvature does not now quite disappear in a hanging or lying position, not always in taking certain bodily positions, nor by means of pressure on the convexity of the curvature, but the spine is, however, still mobile; so that the curvature in the



Fig. 280.—Scoliosis due to faulty posture at school.

given position is diminished, in consequence of which the scoliosis can be treated successfully also in this stage.

The third degree of development in scoliosis is arrived at by the formation of several deformities of the spine itself and of the adjacent bones, whereby the scoliosis becomes *permanent or fixed*, so that the curvature of the spine itself in this stage cannot be treated. The attendant symptoms of shortness of breath, disordered circulation and intercostal neuralgia must, on the other hand, often be treated. The scoliosis in this degree is called kypho-scoliosis.

When a scoliosis develops itself, the *vertebræ* undergo a most radical change from a pathological point of view, and this change is

not easy to detect, but the alterations in the ribs, with respect both to form and position, is the surest symptom from a purely clinical point of view.

Through the uneven pressure to which the vertebræ are exposed in a scoliotic spine, the side directed toward the concavity of the curvature will be slower in growth, while the side directed toward the convexity will develop itself normally. The



Fig. 281.—Same girl; arms folded. Note difference in scapulæ.

consequence of different development will be that the *vertebræ* will gradually assume the form of a wedge, with the point of the wedge directed toward the concave side of the scoliosis.

From a clinical point of view the greatest change is to be found in the *ribs*, so that an incipient scoliosis is most easily detected in the change the chest undergoes in its entirety. The special alterations in the ribs accompany those of the vertebræ. For example, those ribs that correspond to the convexity of the scoliosis will be separated from each other, while those that correspond to the concavity will become compressed and even atrophic. The ribs on the convex side will develop a considerable increased flexion of their posterior extremity, and diminished flexion of their anterior extremity.

A change of position of the sternum does not so frequently occur, but in the above-named form of scoliosis, in some cases, the lower end of the sternum deviates toward the left, *i.e.*, toward the concavity of the curvature.

In a well-marked scoliosis the pelvis will, in consequence of the uneven weighing, also be crooked and asymmetrical, especially in more severe lumbar scoliosis, the os sacrum also takes part in the spinal curvature.



Fig. 282.—In cervical scoliosis, side flexion in the region of the neck can best be obtained by having a boom or crutch placed under the armpit, at a height to obtain a firm support. This position should be retained from three to five minutes.

As regards the *muscles of the spine*, the change in the same was formerly considered to be very considerable, and it has even been considered as being the origin of the scoliosis. In well-marked scoliosis the long dorsal muscles that run over the convexity of the curvature become stretched and even atrophic, perhaps mostly in consequence of the rigidity of the spine and the consequent inactivity of the muscles.

The *shoulder-blade* is removed from its normal position by the change in the chest. The shoulder-blade on the convex side is pushed forward by the increased posterior bulging out of the ribs in the

direction upward, backward and outward from the middle line; the shoulder-blade on the concave side sinks, because the ribs on this side will be less curved posteriorly, and the shoulder-blade draws nearer to the middle line.

When muscular weakness due to faulty nutrition exists, we have a predisposition which asserts itself in a faulty posture, such, for instance, as an incorrect writing position or various kinds of female handwork. Infantile paralysis, by virtue of its arrested development, will cause a shortening of the affected leg, and thereby be a factor in the development of a spinal curvature in the lumbar



Fig. 283.—Exercise adapted for lateral curvature. Patient sits on a stool in such a manner that the anterior bent leg rests on the floor, while the whole of the buttocks and the upper leg rests on the stool. This position is maintained while ten to twenty deep breaths are drawn.

region. In children, faulty position in standing, as, for example, standing on one leg or sitting so that the body weight rests on one buttock, is a common cause of lumbar scoliosis. Eulenburg states that rachitic scoliosis is found in 50 per cent. of cases during the second year of life, 25 per cent. during the third year, and from the fourth year a decrease down to the sixth year. When a general rachitis exists or when we note the presence of a pigeon-breast or a funnel-shaped breast, in such children one is likely to meet with a rachitic scoliosis. Pleurisy with effusion is another cause of scoliosis. If the effusion remains, or results in a pyothorax from the shrinking of the lung and sinking of the diseased half of the chest,

there will result a scoliosis in the dorsal region, having the concavity toward the healthy side.

A radiograph is the most exact method of recording the curvature, and studying the therapeutic results.

Prophylaxis.—In the very young child it is almost impossible to prevent scoliosis when the bodily structure is weak, as in rachitis. In the older child, where the effects of faulty position in sitting or standing can be explained, it is frequently possible to prevent scoliosis.



Fig. 284.—*Sitting-hanging* with rod is principally used for round-back, but also to advantage in scoliosis. The nurse stands behind the patient and offers slight resistance to the rod as the patient stretches his arms, and resistance is still offered when the arm extension has reached its maximum, so that the patient is obliged to keep a stretched and corrected bearing of the body. This position should be maintained from one-fourth to one-half minute. Repeat ten to fifteen times.

Girls between the ages of 8 and 15, especially those who desire to shine by contrast in society, are frequently overburdened with home-work, needle-work, painting or piano practice which frequently requires hours of patient sitting. It is this class of cases in which, by overstrain, the spine is weakened and curvature results.

Treatment.—Only simple curvatures, or those resulting from weak muscles, faulty habits or position shall be considered. Curva-

tures resulting from congenital or pathologic anomalies, caries of the spine, tuberculosis, etc., should be sent to the orthopedist.

Begin with good breathing exercises. Train the habit of posture. Give general light exercises for muscle building and stimulation of the circulation, respiration, and digestion.

It is impossible to lay down rules which can apply to every case of scoliosis. Thus, a *scoliosis of the first degree* will do very well by strictly supervising and preventing the faulty position while at school or at home. In addition thereto, gymnastic exercises to de-



Fig. 285.—Resistance, especially adapted for young children. The patient places his hands in the groin with the four fingers together forward, the thumbs directed backward, thus, by putting the extensors of the arms into action, causing a lifting of the trunk, while stretching takes place at the same time in the spine. The mother or nurse stands at the side of the patient and sees that he carries his shoulders backward as far as possible; slight pressure in the middle of the back and over the crown of his head encourages still greater exertion, *i.e.*, the movement is changed from a purely active one to a movement of resistance.¹

velop and strengthen the muscles of the back and chest will quickly solve this problem. In addition to the mechanical treatment, restoratives, such as iron, hypophosphites, and codliver oil should be given. Fresh air and out-door exercises should form the basis for the tonic

¹ I am indebted to Anders Wide's Hand-book of Medical and Orthopedic Gymnastics, published by Funk and Wagnalls, for the illustrations in this article.

which will help to assimilate food and thus strengthen the bone and muscle.

A scoliosis of the second degree or scoliosis of the third degree requires not only the restorative treatment above mentioned, but, in addition thereto, mechanical treatment. Such mechanical treatment consists in the temporary support given to the spine by plaster-of-Paris cast, or, in many cases, the curvature can be corrected with the aid of a spinal brace. Such brace or plaster-of-Paris support is utilized to correct the curvature, and when the mechanical appliance is removed gymnastic exercises are given to restore the tone of the muscles and aid in the circulation which is disturbed while the mechanical appliance is used. The gymnastic treatment should be supported by massage.

Hanging is especially indicated in cases of kyphosis. The spine and spinal muscles are stretched into their normal position by the weight of the patient's body.

The hands, separated from each other by the width of the shoulders, take hold of the pole or trapeze, placed or held at such a height that the feet do not touch the ground when the arms, trunk, and legs are fully extended.

With heels together and knees straight, have patient bend body forward until the hands touch the floor in front of the toes, or come as near to the floor as possible, then raise the body to a standing position. Repeat slowly ten to fifteen times.

Abbott¹ and others have advised an overcorrection of the curvature to secure normal conditions. Many orthopedists have told me that while this is a painful method it has its advantages. Others have advised against the overcorrection. The method seems best adapted for the very young where marked elasticity of the spinal column still exists.

MORBUS COXARIUS (HIP-JOINT DISEASE; TUBERCULOUS HIP-JOINT DISEASE).

Coxitis, commonly known as tuberculosis of the hip-joint, is not easily diagnosticated in the primary stage.

The age is no hindrance to the development of this disease, as it usually appears between the fifth and tenth years.

Coxitis can be found in apparently healthy children showing no sign of scrofulosis.

¹ Abbott, N. Y. Medical Journal, April 27, 1912.

1. They complain of tenderness.
2. Impediment of locomotion of the affected extremity.
3. The change of the position.
4. Local changes in the region of the joint.

Symptoms.—The pain is one of the earliest symptoms and expresses itself by a feeling of tenderness in the affected joint or in the knee. The knee is quite characteristic in this affection and serves a good center for deception. In the knee no changes are directly noticeable; there is no impediment to locomotion. When the pain can be located in the knee-joint the pathological process in the hip-joint is usually fully developed. When children complain of



Fig. 286.—Tuberculous coxitis—
Front view.



Fig. 287.—Tuberculous coxitis—
Side view.

pain in the knee-joint, it is always wise to examine the hip. One of the most characteristic symptoms is the invariable cry at night.

The child will cry frequently and will suddenly awaken at night, with pain along the thigh not pointing to a distinct spot, but showing that the pain is diffused along the leg; this symptom is rarely absent in true coxitis.

At the earliest stage of coxitis the pain is trivial, but instinctively the patient tries to use the healthy limb and not the unhealthy one. This is one of the causes of limping. When tenderness can actually be located, then locomotion is also limited. When this exists, difficulty in abduction and adduction appears.

When examining by grasping the affected limb with one hand and supporting the small of the back with the second hand, a distinct resistance of the muscles can be felt.

TUBERCULOUS COXITIS (DOUBLE).

C. M., 10 years old, girl. Duration of disease, in left hip six years, and right hip five years. No history of exanthematous diseases. Treated at the Post-graduate for seven months in orthopedic ward. An erosion of disease in left hip at this time.

Examination.—Right hip flexed to 90° degrees, left hip flexed to about 95 degrees. Right hip in adduction 10 degrees, distinct spasm of the adductor muscles. Left hip in adduction 35 degrees, slight spasm of the adductor muscles. Motion in right hip 10 degrees, in left hip 20 degrees. Right great trochanter two inches above Nelaton's line. Apparently no abscesses. Left trochanter almost denuded by erosion, only slightly above Nelaton's line. Many abscess scars, all healed.

Treatment.—Modified Gant on right side, forcible correction of the left side, with tenotomies.

CONGENITAL DISLOCATION OF THE HIP.

This is the most frequent form and the most important of the congenital dislocations.

Etiology.—Faulty development of the acetabulum and the head of the femur combined with laxity of the capsule and possibly pressure upon the flexed thigh are supposed to be the causes of this condition. The displacement is usually upon the dorsum, although it may take place forward or upward. It is most frequent in females. Whitman states that 85 per cent. occur in females. It is usually seen unilateral. I have seen many cases bilateral. Sometimes a peculiar family predisposition seems to exist, as several children in the same family have this deformity.

Symptoms.—*Unilateral Dislocation.*—The child limps when it begins to walk. The abdomen is very prominent. There is an abnormal lordosis. The buttocks appear enlarged. The thighs are usually separated and there is an increased breadth of pelvis. Shortening is difficult to detect in the beginning of the disease, but if the child grows older and the condition has been neglected, then a shortening of several inches may sometimes be detected. Such children are easily fatigued.

Bilateral Dislocation.—The pelvis is broadened and the thighs are far apart when the patient stands or walks. The limp is exaggerated and the child waddles. The lordosis is very marked.

Treatment.—Replacement by traction, by extreme abduction and flexion with prolonged fixation in the attitude of extreme abduction, known as the Lorenz treatment, is frequently successful and a radical operation must then be performed.

PLATE LXXVIII



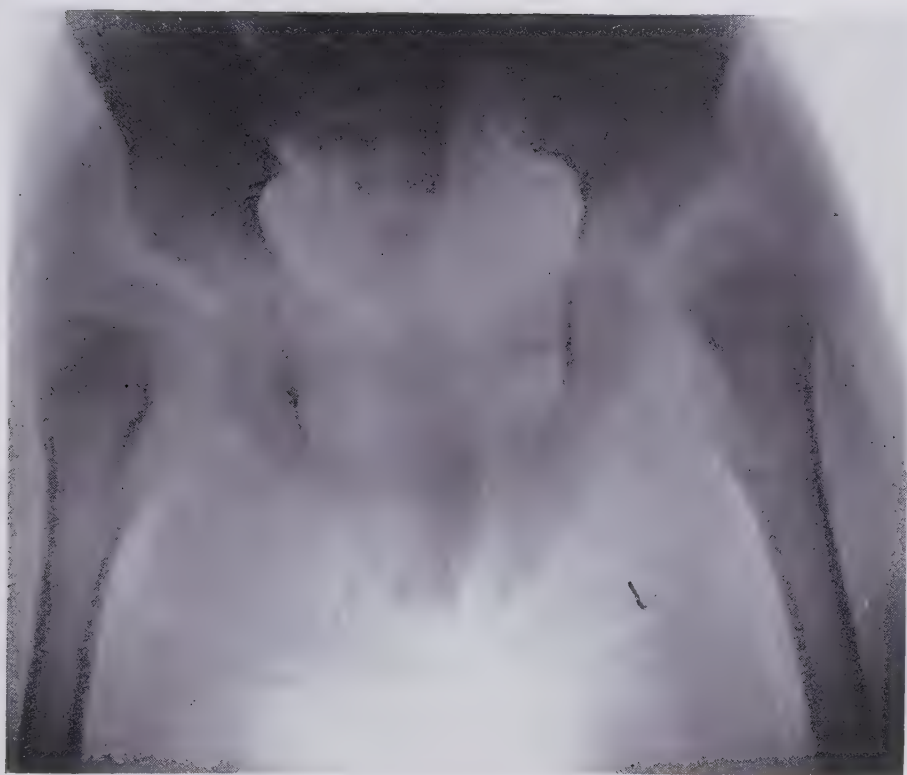
X-ray of congenital dislocation of hip.

PLATE LXXIX



Double congenital hip dislocation.

PLATE LXXX



Double congenital hip dislocation after reduction.

G. L., male, 9 years old; A. L., female, 6 years old; H. L., female, 4 years old. Three out of five children in one family, of Irish parentage. No previous history of lameness.

G. L., double posterior dislocation; muscular; great telescopic motion; right side has a shortening of $2\frac{1}{4}$ inches, left side $2\frac{3}{4}$ inches, as per Nelaton's line; head and neck apparently well developed; thighs flexed, adducted and rotated inward; marked lordosis; walking ungainly and laborious; limited motion in abduction and extension; feet inclined to be



Fig. 288.—Congenital hip dislocation. Courtesy of Dexter Ashley.

flat; can stand in almost normal position except lordosis. Skiagraph reveals very well-developed neck on each side, the right inclined to coxa varus; head on each side inclined to be conical; acetabula rather shallow, but well formed otherwise. Advised no operation as the child was too old, and the circumstances of the family would not admit of good after-treatment.

A. L., right posterior dislocation; distinct limp; limb carried slightly in adduction; shortening $1\frac{1}{2}$ inches; neck short and straight, or coxa valgus. Skiagraph verifies above observations, and shows an apparently poorly formed acetabulum, with considerable thickening. Preternatural mobility in all directions except abduction. Operation advised and performed. Transposition secured.

H. L., 4 years old; posterior dislocation; $\frac{3}{4}$ inch shortening; limp well marked; neck and head rather short but of normal angle; preternatural mobility in all directions except abduction. Skiagraph reveals short head and neck, apparently well-formed acetabulum. Operation performed. Very good result, but might have been improved upon if child had been brought in for after-treatment.

KNEE-JOINT DISEASE.

This is a chronic tuberculous inflammation due to an osteitis of the femur or tibia. It may begin as a synovitis similar to hip-joint disease.

Etiology.—Traumatism is usually the exciting factor, as in hip-joint disease.

Pathology.—The pathological lesions are those of tuberculosis. The tubercle bacillus is usually found, although it may be absent. The lesions spread and sometimes cause complete destruction of the joint. A characteristic swelling noted in tuberculous knee-joint is caused by an infiltration of the soft parts with a gelatinous substance which must be attributed to a tuberculous process.

Symptoms.—Children old enough to complain will describe pain when moving the joint. A limp is noticed when walking. A swelling of the joint gradually appears. The knee assumes a flexed appearance which is quite typical of this condition. As a result of the swelling in the joint, motion is limited, and the pain at times is very severe. Fever may or may not be present. In a case seen by me recently, although a large quantity of pus was present, no fever could be detected. This condition was one of the usual "cold abscess type."

Diagnosis.—This depends on the limitation of motion, on the swelling, and on the pain. It does not resemble rheumatism owing to the affection being limited to one joint. In rheumatism there is fever, at times very high fever, inflammation, swelling, and a sudden onset of symptoms. Just the reverse condition is found in knee-joint disease.

Prognosis.—The prognosis as a rule is good. Fully 90 per cent. of cases recover, according to Moore. When, however, cases are neglected, ankylosis of the knee-joint results.

Treatment.—Rest in bed, assisted by proper hygiene and a good supporting diet, constitute the general line of treatment to be pursued by the general practitioner. The deformity requires careful orthopedic treatment. A case of this kind usually requires

a knee-splint or a plaster cast. It is self-understood that only one competent to do this should guide the treatment. For details regarding the application of knee-splints, etc., the reader is referred to works on orthopedic surgery.

DISEASES OF THE ANKLE-JOINT AND TARSUS.

Tuberculous disease frequently affects the ankle and tarsus. The same pathological manifestations described in hip and knee-joint diseases are found here.

Symptoms.—As a rule a limp will be noticed. Associated with this there is swelling of the joint, limitation of motion, and in some cases fever; in other cases, atrophy of the muscles of the leg. The superficial veins are usually enlarged.

Diagnosis.—The slow onset of the symptoms associated with swelling and the limp on walking will usually aid in establishing the diagnosis. It is important to exclude rheumatism by carefully examining other joints of the body. The diagnosis rests upon the disease being limited to one joint in addition to the symptoms above described.

Prognosis.—The prognosis is usually good. Cases usually recover under proper management in six to nine months.

Treatment.—The same treatment described in the article on knee-joint disease applies here. The parts should be given absolute rest. This can be secured by the use of plaster-of-Paris casts. The rest of the treatment is restorative.

WRIST-JOINT AND ELBOW-JOINT DISEASES.

This condition is rarely met with in children. When, however, tuberculous manifestations exist the symptoms are the same as described in other tuberculous joints.

Treatment consists in securing rest and immobility of the parts with the aid of plaster casts. Pus, when present, requires surgical relief. The outcome of these cases is as a rule good.

Joseph S., 10 years old, has been under the treatment of Dexter Ashley, to whom I am indebted for the illustration. The child was in an extremely anemic condition, heart and lungs normal, no evidence of tuberculosis. Family history good. Local evidence of tuberculosis involving the elbow-joint, so-called bone tuberculosis. The boy was able to run about, and excepting this arm, seemed to be in fair physical condition. A comparison of the healthy elbow-joint with the diseased joint is quite interesting.

Ashley's treatment consisted in strict aseptic dressings, tight bandaging, a bandage to support the return circulation, and general restorative treatment.

ACUTE ARTHRITIS (INFECTIOUS OSTEITIS: ACUTE PURULENT SYNOVITIS: ACUTE EPIPHYSITIS).

This is an acute inflammatory condition involving a joint. It is always suppurative from the beginning; it is therefore a form of



Fig. 289.—Tuberculous elbow-joint.

pyemia. It is an infection originating at the bone in the medullary canal or in the joint.

Etiology.—This condition may follow the acute infectious diseases, especially those which show a tendency to suppurative processes. It most frequently follows measles, scarlet fever, and empyema.

There seems to be no reason to believe that this disease owes its existence to syphilis or tuberculosis. Some authors state

that a history of traumatism has preceded this infectious disease.

Bacteriology.—Cultures taken of the purulent discharge usually show the presence of the streptococcus pyogenes or the staphylococcus. The point of entrance for the pathogenic bacteria may be either the skin, if abraded, the umbilicus, or the tonsil. In this manner the bacteria gain entrance to the circulation.

Symptoms.—Distinct swelling of the joint can be made out, although the inflammatory condition is deep-seated. The joint is red and inflamed and has a glazed appearance. Fluctuation can be felt if properly palpated. The usual symptoms of inflammation, such as high fever and chills or rigors, are present.

The joints most usually affected are best judged by studying Townsend's collection of cases:—

| | |
|------------------------|-----------|
| Hip | 38 cases. |
| Knee | 27 cases. |
| Shoulder | 12 cases. |
| Wrist | 5 cases. |
| Elbow | 4 cases. |
| Ankle | 4 cases. |
| Fingers | 2 cases. |
| Toes | 1 case. |
| Sternoclavicular | 1 case. |

Diagnosis and Differential Diagnosis.—The diagnosis is easily made if we remember the rapidity with which this condition develops. It may resemble rheumatism, but the acute onset with the fever and the suppuration makes it easy to exclude rheumatism. Syphilis may resemble arthritis, but the fever and suppuration are never present in syphilis.

Prognosis.—If the disease extends rapidly death may occur in a few days. The outcome of the case depends on recognizing the disease in its early stages, and on the rapidity with which the suppurative condition is relieved.

Treatment.—The treatment is surgical. With aseptic care and attention to surgical detail, pus should be evacuated and the joint properly immobilized. To prevent deformity fixation of the joint should be remembered. Restorative treatment should consist in giving arsenic, maltine with hypophosphites, in addition to concentrated food and general hygienic care. The surgical treatment should be given into the hands of a surgeon.

STILL'S DISEASE (CHRONIC ARTHRITIS: ATROPHIC ARTHRITIS).

This condition is by no means rare. It occurs more frequently in boys than in girls. Chronic joint affections which result from lesions of the synovial membrane and involving the joint structure, frequently leave permanent changes involving the bone and cartilage.

Etiology.—This condition is a sequela to, and frequently follows the acute infectious diseases. It frequently follows scarlet fever. This has been noted by Demme, and also during my service at the Willard Parker Hospital.

The suppurative process may involve the cranial sinuses, or it may be associated with purulent infections involving the teeth and tonsils.

This condition is entirely distinct from syphilis or tuberculosis. The lesion involves the capsules of the joints, the ligaments and surrounding structures. There is a thickening of the synovial membrane and an extravasation of fluid in the joint. When this condition persists for years there may be ankylosis.

The bones show evidences of atrophic changes. The spleen and lymph glands are enlarged, but show no other pathological changes.

Symptoms.—The joints most frequently involved are those of the arms and legs. While the inflammatory involvement is usually symmetrical, one side may be more affected than the other.

The temperature is usually between 101° and 102° F., rarely higher. The skin covering the joint is tense and shiny. The superficial lymph nodes can be palpated, likewise the inguinal, axillary, and cervical glands—at times the epitrochlears.

The spleen is large. There is albuminuria and frequently casts.

Prognosis.—This is usually very bad. Unless a change of climate is made—to the South, and careful dieting carried out, these cases end fatally. Deformity frequently occurs.

Treatment.—Focal infections are responsible for this condition hence they should be eradicated. Suppurative processes involving the tonsils, teeth and the accessory sinuses should be removed.

Local treatment and drugs are useless as long as a chronic suppurative focus exists in the body.

PART XII.

Miscellaneous.

I.

DEVELOPMENTAL EXERCISE.

GENERAL GYMNASTIC THERAPEUTICS.

For the Normal Child.—Exercises and gymnastics, in general, should be prescribed by the physician. Before doing so it is important to note which part of the body is weak, then aim to improve, develop, and correct the same.

The examination should consist of noting the condition of the skin, its elasticity; its fatty and muscular development. Note the tone of the muscles, are they flabby? The chest, the breathing—especially the expansion—should be carefully noted. The height, the weight and the measurements of the neck, chest, and abdomen are important guides.

The spine should be carefully inspected for any deviation or curvature. The spinal bones inspected for the presence of Pott's disease, kyphosis or scoliosis. The reflexes should be examined, their absence or presence noted. Any exaggeration should be noted. The abdomen should be inspected for distention, the liver and spleen palpated, the existence of constipation or diarrhea ascertained.

No physical examination is complete without an examination of the lungs. Inquiry should be made as to whether abnormal breathing followed a previous pneumonia, pleurisy or "flu." Lack of expansion is easily detected, and before gymnastics are prescribed an x-ray may be helpful to exclude an empyema or latent tuberculosis. The blood-pressure should always be taken, likewise the heart sounds examined. The presence of any cardiac lesion is always an indication to prescribe gradual systematic exercises with constant supervision. It is important to note the frequency and quality of the pulse before and after a given amount of gymnastics. It is a serious matter to send a child

with an endocarditis to a gymnasium, and permit haphazard developmental exercises. Therapeutic results cannot be attained by such hit or miss methods. Collapse and syncope frequently occur during an over indulgence or in the course of very strenuous exercises. It is up to the physician to prescribe a definite series of exercises, follow them up by close supervision of the pulse, and note the amount of exhaustion if any.

The effect of daily gymnastics is at times too strenuous. It may be safer to begin physical culture every other day, and as the circulation and general tone of the system improves, order the exercises taken daily.

Bathing.—Gymnastic exercises should always be followed by a bath. This bath should be a tub bath at a temperature of 90° F. to which one pound of sea salt is added, and should be followed by a cold spray or shower. This bath should be followed with brisk friction with a coarse turkish towel, and if the result has been beneficial the circulation must be improved and the skin attain a pinkish color.

When a tub bath is inconvenient, then a lukewarm shower, followed by a cold shower may be substituted.

Temperature of Room.—The tendency of all exercise is to stimulate the circulation and restore warmth. If the skin prior to exercise appears chilly or sensitive, then active gymnastics will promptly restore the cutaneous circulation. It is therefore unnecessary to begin exercises in a warm room. It is more advisable to have a good current of fresh air in the room, the temperature to be no less than 55° F. but no more than 68° F.

How Shall Exercise be Given?—For the proper expansion of the chest and to permit deep breathing and perfect freedom of the arms and legs, a loose wrapper, pajamas or bathing suit should be worn.

Special forms of exercise are adapted for *infantile paralysis*. So much can be gained by a systematic course of muscle education that some results seen by me are remarkable.

During the epidemic of poliomyelitis in 1916, hundreds of cases were seen at the Willard Parker Hospital and likewise in private practice. To one not familiar with muscle education most of these cases would appear as hopeless. Many of these cases in the hands of our best orthopedists have resulted in practically normal conditions. At the Willard Parker Hospital, Nutt; and at the Hospital for Deformities (Frauenthal) have

prescribed a definite amount of exercise, which aided by braces and supports have given excellent results.

Mirror Exercises.—Double mirrors are necessary so that the child can see the correct position desired. He should be screened in a small room so that his attention is confined to his work. Concentration is necessary and this can only be attained by patience and perseverance on the part of the attendant or nurse in charge of the patient.

Repetition of the exercises should be insisted upon. This should be repeated daily until the child grasps the idea and learns to master it. In many cases where the surface temperature is subnormal and the limb feels cold it is of advantage to first immerse the limb in warm water and stimulate the circulation by friction. Another method of warming the limb is by electric heat such as the leucodescent lamp. After the limb is warm then exercise or gymnastics should begin.

Frequency of Exercise.—A prescribed amount of exercise beginning with 15 minutes, increased to 30 minutes, and later one hour; at first three times a week, later daily until the object of our developmental exercises has been attained.

A certain amount of muscle soreness is expected in children who have led an inactive life. This is especially notable in children who begin with very strenuous work. Muscle soreness quickly disappears and is of no pathological significance.

Fatigue from Overwork.—If the exercises have been very strenuous and the patient has been overworked, a lesser amount, with more rest following the exercise should be ordered.

In anemic children, or in convalescent cases following any of the acute infectious diseases, exercise should be moderate the first few weeks until normal strength has returned.

Contraindications for Exercise.—During any acute febrile condition or during any bronchial or other acute infection such as a sore throat, exercise should be omitted.

Exercises may also be given with advantage even though a systolic murmur or other cardiac lesion is present. This will be described later on.

The tendency of every child is to relax and forget corrective exercises with especial reference to posture. It is advisable to enlist the co-operation of one or more intelligent members of a household to carry out all rules necessary to secure better posture. When expansion of the lungs with the aid of pulmonary

gymnastics is demanded, then several should assist in carrying out the orders for deep breathing.

Pulmonary Gymnastics.—Every physician encounters a number of flat chested children, especially in the rachitic and pre-tuberculous type. Many bed-ridden children convalescent from exhaustive diseases such as scarlet fever, diphtheria and pneumonia require deep breathing exercises to promote thorough oxygenation of the lungs. Such exercises should be ordered daily before an open window. The child instructed to inhale and exhale slowly at least ten times. Breathing exercises should be ordered for the relief of flat chested children, morning and evening. There is no danger of taking cold if the body is well covered with wrapper or pajamas.

School Room.—Recurring attacks of rhinitis caused by overheated rooms in which there is an absence of moisture may sometimes be found in a school room or in a living apartment. The air that we breathe, should be moist, hence if a radiator is used for heating purposes, steaming water should be in the room at least several hours a day. Dryness of the throat is a sequela to dry heat, lacking moisture, and this leads to congestion and catarrh. Many cases of adenoids owe their inception to recurring catarrhal and inflammatory conditions caused by faulty hygiene. Corrective exercises and proper oxygenation are valuable aids in this condition.

Hardening.—In susceptible children there is no better means of hardening and preventing susceptibility to colds and coughs than by keeping them in a fit physical condition. This requires daily exercise, careful hygiene, such as the daily bath permitting the skin to throw off toxic material, and the regulation of the gastrointestinal tract. One can usually find that sensitive and susceptible children are those who are kept indoors and are permitted to lead a sedentary life.

In dealing with cardiac lesions, both acute and chronic, greater care is necessary in ordering gymnastic or developmental exercises. Such symptoms as dyspnea, fatigue, a very rapid pulse with intermitting or irregularity require careful supervision and especial reference to the effect on metabolism.

Loss of weight, twitching, insomnia and nose-bleed are symptoms which should contraindicate strenuous exercise, and no physician should permit violent exercise, or competition as in races, when tendencies to bleeding or cardiac arrhythmia follows.

Shall Exercise be Prescribed for the Cardiac?—From a series of investigations and recent studies made of a group of 116 school children between the age of six and fifteen years, having heart disease, interesting deductions can be made.¹

These cardiac lesions were congenital and acquired.

The test exercises utilized by Wilson were:—

1. Swinging two iron dumb-bells (2, 3, 4, 5, 7, and 10 pounds each) from the floor to the full stretch of the arms overhead and back again between the legs at a constant rate of two seconds for each swing. This movement was repeated from ten to forty times to increase the amount of work. Each child performed at each visit two or three of these exercises graded from moderate to severe until the maximum effort was approached, as evidenced by marked breathlessness, flushed face and fatigue. In all there were 47 normal and 116 cardiac children, each receiving three to twenty tests.

2. Stair-climbing tests. Two and four flights of stairs (from twenty-five to sixty steps) with a total rise of 15 and 30 feet, respectively, taken in from twenty to forty seconds. Seventy-four children were tested, 27 normal and 47 cardiac, each receiving two or three tests.

3. Jumping rope. Rope was jumped 100 times in 100 seconds. Fourteen children were tested, 5 normal and 9 cardiac.

Setting-up Exercises.—There was a thirty minute drill daily for six weeks by 25 children from the cardiac group. Only the symptoms following these exercises were noted.

Observations of Exercise Tolerance in Children with Heart Disease.—Any classification of these observations necessarily must be arbitrary. The terms “normal,” “fair” and “poor” were used for purposes of convenience.

Twelve of the 13 children with congenital malformations of the heart had a normal tolerance for standardized test exercises. The one case in which there was a poor tolerance was also a case of hypertension.

Of the 58 patients with chronic valvular disease, 36 had mitral insufficiency; of these, 23 had a normal tolerance and 13 had a fair tolerance for standardized test exercises.

Of 20 with mitral stenosis and insufficiency, 12 had a normal tolerance, and 8 a fair tolerance for standardized test exercises.

¹ WILSON: Exercise Tolerance. Jour. Am. Med. Ass'n., June 11, 1921.

Of 2 with aortic regurgitation and mitral stenosis, both had a normal tolerance.

Six patients with chronic valvular disease had moderate symptoms of insufficiency; all of these showed a poor tolerance which improved from week to week, as the clinical symptoms of cardiac insufficiency diminished.

Of the 19 patients with possible heart disease with apical systolic murmurs, one had a poor tolerance, the remaining having normal tolerance.

Of the 20 potential cardiac patients all had a normal tolerance.

Children having a normal tolerance for dumb-bell test exercise also had a normal tolerance for four flights of stairs and jumping rope a hundred times. Twenty-five children of the cardiac group having normal and fair tolerance for the dumb-bell test and for the stair-case test were able to tolerate thirty minute setting-up exercises daily for a period of six weeks.

Of the 71 children having definite organic heart disease, without symptoms of cardiac insufficiency, 69 per cent. had a normal tolerance for standardized test exercises, 29 per cent. had a fair tolerance, and 2 per cent. had a poor tolerance. Of the entire cardiac group of 116 children, only 8 per cent. were found to have poor tolerance.

CONCLUSIONS.

1. The circulatory reactions after test exercises in 45 normal children, and in 116 children with heart disease, confirmed the results obtained in the 20 normal children of the previous study, in all essential points.

2. A working table was formulated of standardized test exercises followed by normal systolic blood-pressure curves, without symptoms of dyspnea and fatigue. It was standardized from an analysis of the reactions of an average group of 65 normal children according to age, weight and height.

3. The degree of distress and type of systolic blood-pressure curve following standardized test exercises was used as a gauge in estimating the exercise tolerance of children with heart disease.

4. Of the 71 children having definite organic heart disease, without symptoms of insufficiency, 69 per cent. had a normal

tolerance for standardized test exercises, 29 per cent. had a fair tolerance, and 2 per cent. had a poor tolerance.

5. In children with chronic organic heart disease, exercise tolerance tests give important and useful information which may be utilized as a scientific basis for intelligent regulation of the child's activities. The observations resulting from this investigation would seem to indicate that the fear of exercise is unwarranted, and that a wider latitude may be permitted with safety.

II.

DIETARY.

BEVERAGES.

Albumin Water.—Stir the whites of 2 eggs into $\frac{1}{2}$ pint of ice-water, without beating; add enough salt or sugar to make it palatable. Such a mixture is one of the best foods we have for substitute feeding an infant with digestive disturbances when we wish to temporarily stop all milk-food.

Arrowroot Water.—Add 2 tablespoonfuls of arrowroot to 1 pint of water; allow it to simmer for half an hour, stirring it constantly.

Barley Water.—Take a tablespoonful of coarse barley, or of barley flour (the latter must be rubbed into a paste with cold water) add 1 quart of cold water, and allow it to simmer slowly for about an hour. Strain and add enough water to make 1 quart.

Beef Juice.—Expressed beef juice is obtained by slightly broiling a piece of lean beef and expressing the juice with a lemon-squeezer. One pound of steak yields 2 or 3 ounces of juice. This is flavored with salt and given cold or warm. Do not heat enough to coagulate the albumin. This is very nutritious and usually well taken. It may be given at the rate of a tablespoonful three times a day.

Cocoa.¹—For each large cup take a teaspoonful of cocoa and a teaspoonful of sugar; mix to a paste with a little boiling water or milk; add balance of milk or milk and water, as richness is desired. Let it boil a minute, as boiling improves it.

Chocolate (Unsweetened).—For each breakfastcup take 1 teaspoonful of broken chocolate and allow it to melt; add milk or milk and water, as richness is desired. Stir constantly. Bring to a boiling point and set aside to simmer. Sugar to taste.

Eggnog.—Heat some milk to a temperature of 150° F., *but do not allow the milk to boil*. When cold, beat up a fresh egg with a fork in a tumbler with a teaspoonful of sugar; and fill up tumbler with the warm milk. When indicated a teaspoonful of whiskey may be added.

¹ A palatable and digestible form of cocoa is manufactured by Hershey, of Pennsylvania.

Oatmeal Water.—Take a tablespoonful of ordinary oatmeal, and add 1 pint of water. Allow it to simmer slowly for one hour and strain. Add enough water to make 1 pint. The same directions apply to making a household mixture of farina-water, and sago-water, using the same proportions as above.

Rice Water.—One ounce of well-washed Carolina rice. Macerate for one hour at a gentle heat in a quart of water, and then boil slowly for $\frac{1}{2}$ hour and strain. It may be sweetened and flavored with a little lemon-peel. Useful in diarrhea, etc., when the flavoring is best dispensed with, and a little roasted flour added.

Yolk of Egg Lemonade.—Take the beaten yolk of 1 egg and add to it the juice of $\frac{1}{2}$ lemon. Let stand five minutes, thus drawing off the raw taste of the yolk of egg. Add 1 teaspoonful of sugar and 8 ounces of water.

White of Egg Orangeade.—Take the juice of 1 orange and 1 ounce of water, insert an egg whisk, and when the orangeade is in full agitation, add slowly the white of egg. Continue the whisking for two or three minutes more. Add $\frac{1}{4}$ teaspoonful of sugar.

SOUPS AND BROTHS.

Chicken Broth.—Cut up a small chicken, put bones and all, with a sprig of parsley, salt, 1 tablespoonful of rice, and a crust of bread, in a quart of water and boil for one hour, skimming it from time to time. Strain through a coarse colander.

Keller's Malt Soup.—Take of wheat-flour 50.0 (about 2 ounces). To this add 11 ounces of milk. Soak the wheat-flour thoroughly, and rub it through a sieve or strainer.

Put into a second dish 20 ounces of water, to which add 3 ounces of malt extract; dissolve the above at a temperature of about 120° F., and then add 10 cubic centimeters (about 2 $\frac{1}{2}$ drams) of 11 per cent. potassium bicarbonate solution. Finally mix all of the above ingredients, and boil.

This gives a food containing:—

| | |
|---------------------|----------------|
| Albuminoids | 2.0 per cent. |
| Fat | 1.2 per cent. |
| Carbohydrates | 12.1 per cent. |

There are in this mixture:—

| | |
|--------------------------|--------------|
| Vegetable proteins | 0.9 per cent |
|--------------------------|--------------|

The wheat-flour is necessary, as otherwise the malt soup would have a diarrheal tendency. The alkali is added to neutralize the large amount of acid generated in sick children. Biedert emphasizes the importance of giving fat, rather than reducing its quantity, in poorly nourished children, and cites the assimilability of his cream-mixture or of breast-milk in underfed children as proof of his assertions. The author has used this malt soup most successfully in the treatment of athrepsia (marasmus) cases in which the children were simply starved.

Mutton Soup.—Cut up fine 2 pounds of lean mutton, without fat or skin. Add 1 tablespoonful of barley, 1 quart of cold water, and a teaspoonful of salt. Let it boil slowly for two hours. If rice is used in place of barley, soak the rice in water over night, if it is to be boiled in the morning.

Oyster Broth.—Cut into small pieces 1 pint of small oysters; put them into $\frac{1}{2}$ pint of cold water, and let them simmer gently for ten minutes over a slow fire. Skim, strain, and add salt.

PUDDINGS AND DESSERTS.

Calf's-foot Jelly.—Thoroughly clean 2 feet of a calf, cut into pieces, and stew in 2 quarts of water until reduced to 1 quart; when cold, take off the fat and separate the jelly from the sediment. Then put the jelly into a saucepan, with the shells and whites of 4 eggs well mixed together; boil for a quarter of an hour and strain while hot through a flannel bag into a mould. Flavor with lemon or orange.

Baked Apples.—Core and pare 2 tart apples; fill the core-holes with sugar; grate over the apples a little nutmeg; add a little water to baking-pan and put in oven and bake until the apples are soft. Serve with rich milk or cream. Sprinkle with icing sugar, if not sweet enough.

Cornstarch Pudding.—Take 1 pint of milk, and mix with it 2 tablespoonfuls of cornstarch; flavor to taste; then boil the whole eight minutes; allow it to cool in a mould.

Custard Pudding.—Break 1 egg into a teacup, and mix thoroughly with sugar to taste; then add milk to nearly fill the cup, mix again, and tie over the cup a small piece of linen; place the cup in a shallow saucepan half-full of water and boil for ten minutes.

If it is desired to make a light batter pudding, a teaspoonful of flour should be mixed in with the milk before tying up the cup.

Infant's Gelatine Food.—About 1 teaspoonful of gelatine should be dissolved by boiling in $\frac{1}{2}$ pint of water. Toward the end of the boiling 4 ozs. of cow's milk and 1 teaspoonful of arrow-root (made into a paste with cold water) are to be stirred into the solution, and 1 to 2 tablespoonfuls of cream added just at the termination of the cooking. It is then to be sweetened with one teaspoonful white sugar, when it is ready for use. The whole preparation should occupy about fifteen minutes.

Junket of Milk and Egg.—Beat 1 egg to a froth and sweeten with 2 teaspoonfuls of white sugar. Add this to $\frac{1}{2}$ pint of warm milk; then add 1 teaspoonful of essence of pepsin (Fairchild); let it stand till it is curdled. The above is useful in typhoid and similar wasting diseases.

Junket.—Add 1 teaspoonful of liquid rennin to 1 pint of milk. Mix and heat until the steam rises. Pour into cups and set aside to cool. Flavor with vanilla if desired. Or, to a bowl containing 8 ounces of cool milk, add 1 teaspoonful of pepsencia (Fairchild). Mix thoroughly. Place bowl in pan of boiling hot water, two minutes. Remove, and let stand until jellied.

Predigested Eggs.—Break a fresh egg. After thoroughly stirring add to it 2 grains of caroid powder and stir thoroughly. The yolk is at once changed into a limpid liquid and soon, though not so quickly, the albumin is completely dissolved. This is done at a temperature of 70° to 80° F.

Predigested Rice.—Take $\frac{1}{4}$ pound of rice, add water, and boil until soft. Break grains by passing through a colander. Take, of bana-diasase,¹ 8 grains, and dissolve it in 1 ounce of water and add to the rice, which must be kept warm, but not hot. Let stand for two hours at a temperature of 105° F. When rice is thoroughly softened, season with salt, sparingly. Add a little cream if desired. Serve hot or cold.

Rice Pudding.—Boil a teacupful of rice, drain off the water; add a tablespoonful of cold butter. Mix with it a cupful of sugar, a quarter teaspoonful of ground nutmeg, and a quarter teaspoonful of cinnamon. Beat up 4 eggs very light, whites and yolks separately; add them to the rice; stir in a quart of sweet milk gradually. Butter a pudding dish, turn in the mixture, and bake one hour in a moderate oven.

If you have cold cooked rice, first soak it in the milk, and proceed as above.

¹ American Ferment Company.

Sago Pudding.—Same as above recipe, sago being substituted for rice.

Soft Custard.—Take of cornstarch 2 tablespoonfuls to 1 quart of milk; mix the cornstarch with a small quantity of the milk, and flavor; beat up 2 eggs. Heat the remainder of the milk to near boiling; then add the mixed cornstarch, the eggs, 4 tablespoonfuls of sugar, a little butter, and salt. Boil the custard two minutes, stirring briskly.

Tapioca Cream.—Take 1 pint of milk, 2 tablespoonfuls of tapioca, 2 tablespoonfuls of sugar, 1 saltspoonful of salt, and 2 eggs. Wash the tapioca. Add enough water to cover it, and let it stand in a warm place until the tapioca has absorbed the water. Then add the milk and cook in a double boiler, stirring often until the tapioca is clear and transparent. Beat the yolks of the eggs. Add the sugar and salt and the hot milk. Cook until it thickens. Remove from the fire. Add the whites of the eggs, beaten stiff. When cold, add 1 teaspoonful of vanilla.

Predigested or Peptonized Milk.—This is milk in which the proteins are changed to peptones, or, in other words, digested, by the addition and action of pancreatic ferment. This process may be stopped when partially performed, giving a product of which the taste is not objectionable; or it may be carried on to complete peptonization, when the product has a very bitter, disagreeable taste.

Method.—To partially peptonize milk, add to 1 pint of fresh cows' milk and 4 ounces of water, 5 grains of pancreatic extract and 15 grains of bicarbonate of soda. Allow this to stand at a temperature of 105° to 115° F. for five to twenty minutes, then bring to a boil to kill the ferment, or stand on ice to prevent its further action. If the milk is to be used at once, neither of these latter is necessary.

To peptonize the milk completely, allow the process to continue for one to two hours. After this time the addition of acid produces no coagulation.

In infant-feeding it is better to peptonize a modified than a whole milk. Peptonized milk is frequently very useful in feeding an infant with feeble digestive powers; but it is unwise to continue its use over too long a period, as then the infant's stomach, being called on to do no work, becomes enfeebled from disuse, and gradually unable to perform its proper function.

Whey.—By coagulating 1 pint of fresh (raw) milk by adding a teaspoonful of essence of pepsin, and allowing this to stand, solid curd is formed, swimming in a liquid (whey). This has the following composition: Proteins, 0.86 per cent.; fat, 0.32 per cent.; sugar, 4.79 per cent.; salts, 0.65 per cent.; water, 93.3 per cent.

When such whey is added to milk for an infant under 6 weeks take, of whey, 2 parts; milk, 1 part. This can be increased until equal parts of milk and whey are used for a child several months old.

Preparation of Sweet Whey.—Sweet whey is best made by the following method: For each pint of whey needed take 1 quart of raw milk or fat-free milk, heated to 37.7° C. (100° F.), and add 8 cubic centimeters (2 drams) of the essence of pepsin or some of the preparations of liquid rennet. This will precipitate the casein in the form of a curd, which is then broken up with a fork; the fluid which remains is the whey. This is strained through two thicknesses of boiled cheesecloth and one thickness of absorbent cotton and slowly cooled to a temperature of 10° C. (50° F.), and kept on ice until needed. If the whey is to be mixed with cream, it must first be heated to 65.5° C. (150° F.), in order to kill the rennet enzyme. Whey mixtures should not be heated above 68.3° C. (155° F.) if one wishes to keep safely under the coagulation-point of the lactalbumin. Add 1 teaspoonful of cane-sugar to each pint of liquid.

III.

THE EXAMINATION OF THE GASTRIC CONTENTS IN CHILDREN.¹

CHEMICAL EXAMINATION.²

AFTER the removed chyle is filtered it is ready for the following tests:—

Hydrochloric Acid.—Free hydrochloric acid turns Congo-red a deep blue color; but as the presence of large quantities of lactic and other organic acids gives the same reaction, and as the phloroglucin-vanillin (Günzburg's reagent) does not respond to the organic acids, it is better not to depend upon the simpler Congo-red test. One or two drops of the filtered stomach-contents are placed on a white porcelain dish; the same amount of the reagent is added and thoroughly mixed with a glass rod; the dish is then gently warmed over the flame. The appearance of a bright cherry-red color on the edge of the residue indicates the presence of free hydrochloric acid.

To 10 cubic centimeters of the filtered chyle add 1 drop of phenolphthalein solution; to this add drop by drop from the burette a decinormal solution of potassium or sodium hydrate until after thoroughly stirring, a pink color persists; now read carefully the number of cubic centimeters of the alkali solution used, multiply by 10 and 0.00365 (the decinormal factor of HCl) and the result is the percentage of HCl. If sufficient material is at hand, the estimation should be repeated to avoid possible error.

Lactic Acid (Uffelmann's Test).—One drop of the solution of ferric chloride is added to 20 cubic centimeters of the $\frac{1}{2}$ per cent. carbolic acid solution; this is diluted till a transparent amethyst blue color is obtained. A few drops of the fluid to be tested added to a few cubic centimeters of this solution in a

¹ With a soft flexible catheter siphon the gastric contents about two hours after feeding; if the stomach is irritable and children vomit, then the vomited material is used.

² I am indebted to Boas's valuable book on Diseases of the Stomach and Einhorn's Diseases of the Stomach, for many points in the chemical examination and methods used.

test-tube, change the amethyst-blue to a canary-yellow if lactic acid be present. On account of the presence of various other substances this test is sometimes not distinctive when the untreated chyle is used. A more certain procedure is to add to 10 cubic centimeters of the filtered chyle in a test-tube 110 cubic centimeters of ether; shake thoroughly; allow the ether to separate; decant the ether into a clean test-tube; place the test-tube containing the ether in a glass of warm water till the ether has evaporated; add 5 to 10 cubic centimeters of distilled water to the residue, and test as above for lactic acid.

Propeptone.—To 5 cubic centimeters of chyle, add 5 cubic centimeters of saturated solution of sodium chloride and 2 drops of acetic acid. A cloudiness or precipitate indicates propeptone, especially if the precipitate disappears on heating and returns on cooling.

Peptone.—Filter out any propeptone from the last named; add an excess of sodium hydrate solution; mix thoroughly and add 1 or 2 drops of a weak solution of copper sulphate ($\frac{1}{2}$ per cent.); the appearance of a violet-red or old-rose color indicates peptone. This is the so-called biuret reaction which most peptones and albumoses give.

Pepsin.—For this test we require uniform, small pieces of coagulated albumin; these should be little circular slices of hard boiled white of egg, 1 centimeter in diameter and 1 millimeter in thickness, which may be preserved in glycerine. One of these discs is placed in a test-tube containing 5 cubic centimeters of filtered chyle and kept at a temperature of 99° F.; if it has been already shown that hydrochloric acid is absent, 1 drop or 2 of dilute hydrochloric must be added. The tube is observed every twenty to thirty minutes to note the progress of digestion and the time required for complete disappearance of the egg albumin.

Rennet.—Add a few drops of chyle to 5 or 10 cubic centimeters of milk and place tube in water at a temperature of 99° F.

Motility.—The motility of the stomach may be tested in various ways; probably the salol-test, although open to many objections, is the most used.

This test finds the foundation for its use in the fact that salol is not absorbed until it reaches the alkaline secretions of the intestine, by which it is decomposed. The test is untrustworthy when the stomach secretion is alkaline. The time between ingestion and the appearance of salicyluric acid in the urine is noted by examining the

urine at intervals of one-half and one hour after taking 15 grains of salol (immediately after meal). If salicyluric acid be present in the urine, the addition of a few drops of a solution of ferric chloride gives a violet color. If the appearance of the test be delayed longer than an hour or an hour and fifteen minutes, the motility is usually considered below normal.

IV.

URINE.

METHOD OF COLLECTING URINE.

THE Spicer urinal is a most practical device for collecting urine from infants. It is made of glass having two plane surfaces, one on which it rests, the other containing an opening to admit the penis or



Fig. 290.—Spicer urinal. Used to collect specimens of urine from male and female infants.

to cover the vulva. So constructed to admit the urine and exclude the feces. The patient is allowed entire freedom of movement. In the young infants it is held close to the body by means of the diaper.

THE FIRST URINE.

The first urine drawn by catheter is acid, almost always clear and but slightly colored. During the first four or five days it is more

¹ Sold by Sharp & Smith, Chicago. Described in the Journal of the Am. Med. Assn., June 5, 1915.

or less cloudy from the presence of epithelial cells from the urinary passage, and uric acid salts. The specific gravity averages about 1012. The sediment always contains normal epithelial cells, various forms of uric acid crystals, and now and then hyaline casts. The amount of urine is small (Morse). This is due in part only to the insufficient supply of milk, as the amount is also small in bottle-fed infants. It increases rather rapidly about the fourth day, 20 to 50 cubic centimeters being passed in the first three days, and about 100 cubic centimeters on the fourth day. In the second week it averages between 200 and 300 cubic centimeters.

The proportion of water eliminated in the urine to that taken in the food is greater after the fourth day, averaging 22 per cent. to 25 per cent. before, and 50 per cent. to 60 per cent. after.

The urine of breast-fed babies almost never contains indican, that of the artificially fed baby usually but slight traces. Urobilin is never present in that of the breast-fed, seldom in that of the artificially fed. It does not contain albumin. A trace of sugar is normally present in the urine of normal infants. Greenthal by using Benedict's delicate test, demonstrated this fact. The sediment is slight, and consists entirely of cells. One-third to one-half gram of urea per kilo of body weight is said to be passed in twenty-four hours. Figures are of but little use, however, as the amount of urea varies with the character of the food. It is pretty certain, nevertheless, that from 40 to 50 per cent. of the nitrogen ingested appears in the urine. The amount of urine is relatively large. It varies between 200 and 500 cubic centimeters from one to six months, and between 250 and 600 cubic centimeters up to 2 years.

The urine of the newly born is rich in sodium chloride, which salt diminishes with age. During the first and second months of life it is in the same proportion as in adults. From the third to the fifth year, computed by kilogram weight, the amount is 0.57 gram; at 11 years, 0.44 gram, and at 16 years, 0.18 gram.

Phosphoric acid is seldom found, but when met with it is always in very minute quantity.

Uric acid is present in the earliest urine, and the quantity regularly increases up to the third day, when it rapidly diminishes.

On examining the kidneys of a newly born, the papillæ will be found filled with a reddish substance which obstructs the urinary ducts; this, as is well known, is nothing more than uric acid infarction and has no pathological significance.

Parrot and Robin found urate of soda, sulphate of calcium, magnesium, potassium, benzoic acid, allantoidin, and mucin, and Cruse denies the presence of oxalate of calcium, or hippuric acid. Creatinine and indican are not found in the urine of the newly born or wet-nursed. Xanthine is relatively abundant in cases of nephritis. Rose, Folin, and others have shown that 10-15 milligrams of creatin are excreted daily by normal infants.

In infantile atrophy, as may be presumed, the quantity of urine is far below the normal; it is yellow, acid reaction, often contains organic deposits, sugar, albumin and an excess of urea and phosphates.

In icterus neonatorum the urine is pale-yellow, and contains urates, epithelial cells, and yellow masses of pigment.

The urine of infants with scleroderma is reddish, acid with uratic deposits, and slight excess of urea.

ALBUMIN.

The presence of albumin is always of importance, although not always due to an inflammatory process of the kidneys. It is often the sign of a simple congestion in athrepsia, cholera infantum, general or intestinal tuberculosis, intestinal catarrh, typhoid and scarlet fever.

A small amount of albumin in the form of nucleo-albumin is almost constantly present in the urine during the first four days of life. It often persists for two weeks, and not infrequently for two months. There is much difference of opinion as to the cause of this albuminuria. It has been attributed to the changes in the circulation at birth, to hyperemia resulting from the changes in the metabolism after birth, to renal disease in the mother, and to irritation from uric acid. It is doubtful if any of these explanations are correct. The latest investigations show that albuminuria is no more common in the children of women suffering from nephritis or eclampsia than in others. If uric acid is the cause, its action is probably as a chemic rather than as a mechanic irritant. Many observers regard this albuminuria as physiologic. It is hardly safe to consider it so, however, until more is known about metabolism, the changes due to nourishment, and disturbances of nutrition in the newly born. Whatever the cause, it is certainly not a serious condition, and ought not to be looked upon as the forerunner of chronic nephritis in later life.

In older children the presence of albumin in the urine is always pathological, except when it is the physiological result of the administration of certain drugs (tincture of iodine, etc.).

A slight amount of albumin may be found in nephritic colic due to the stimulus which the uric acid exerts upon the renal parenchyma. At other times, when present, there is an actual inflammation of the kidneys, as in scarlatina and diphtheria; there may be an amyloid degeneration without its being possible to discover any albumin in the urine.

Sometimes children will be found pale, the urine perhaps abun-



Fig. 291.—The horismascope or albumoscope. A new instrument for determining the presence and amount of albumin in the urine. No liability of the acid mixing with the urine. The slightest visible trace of albumin can be instantly detected against the dark background. Color reactions due to urinary and biliary pigments are clearly shown against the white background.

dant or diminished in quantity; it will contain albumin, a few hyaline casts, uric acid and epithelium, yet they will have good appetite, will play and appear otherwise quite well. Others become languid, lose their appetite, complain of headaches, painful micturition, and will pass a turbid and sedimentous urine. In these cases albumin soon appears.

The more severe cases suffer from anuria; partial edema will occur in the eyelids, on the dorsum of the foot, etc. The next day the amount of urine will have been 50 to 100 grams in twenty-four hours. This will increase, perhaps, never to return to the normal.

The color of the urine in Bright's disease will be variable, according to the amount of blood which it may contain, of acid reaction, and average specific gravity of 1010 to 1015. Under the microscope we find red and white corpuscles, hematin, renal epithelium, hyaline or granular casts, uric acid crystals, fat globules, and detritus.

Chronic nephritis may be the result of an acute affection complicating scarlet fever. In these cases children suffer but little and seldom show more than a few edematous spots.

These forms of kidney involvement are rather rare, and cases which have been diagnosed as such have, on autopsy, proven to have been cases of amyloid degeneration due to syphilis, malaria, rachitis, struma, or tuberculosis.

In the mild forms of diphtheria the urine suffers no change whatever, but in the general infection, even in the early stages, albuminuria is found, which is a fairly positive evidence of systemic infection. If the urine diminishes in quantity and blood corpuscles are found under the microscope we may feel sure that the diphtheritic process has invaded the kidney, or else that a nephritis complicates the diphtheria.

In rachitis, albuminuria is comparatively rare; the quantity does not change materially, but the calcium salts have been found in marked diminution. Marchand and Lehman have discovered lactic acid present. The phosphates and chlorides are in very small quantities. The urine of leukemic patients at times contains albumin and many lymph corpuscles as well as hyaline casts. The uric acid and hypoxanthine are in greater quantity.

Diabetes mellitus has been met with at a very tender age.

In a case of pseudo-hypertrophic paralysis Dennen reports marked glycosuria.

Hemoglobinuria is found in Winckel's disease, and the same as in adults, in malaria, syphilis, and as a result of exposure to cold.

Hematuria and pyuria have no special significance beyond that which they have in adults.

Uric acid is in excess during the first week and is a physiological phenomenon; later on, deposits of urates and uric acid appear in the course of serious diseases of the digestive apparatus. Under other circumstances, the oxidation of nitrogenous substances being diminished (by diseases of the respiratory or central nervous system), deposits of oxalate of calcium occur.

Infarcts of uric acid may be found even up to the seventh or eighth week. Children will strain, make repeated efforts and cry out during urination; the diaper will be found stained with a darker urine than usual; the edges of the wet surface will be seen reddened by a yellowish-pink sandy deposit. A careful analysis of this urine regularly shows an excess of uric acid, many epithelial cells, a few pus corpuscles, and mucus and traces of albumin. Quite frequently the urine is so acid as to produce such pronounced evidences of pain

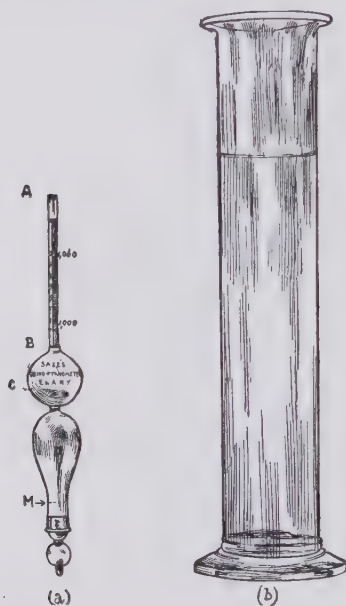


Fig. 292.—Urino-pyknometer, for estimating the specific gravity of small volumes of urine.

on the part of the infant as are met with in the nephritic colic of adults.

When tubercle bacilli are present in urinary sediment, the diagnosis of tuberculosis of the kidneys, ureters, or bladder may be positively made. Care should be exercised not to confound the tubercle bacillus with the smegma bacillus, which may often be present in the same specimen of urine and which stains like the former, though it decolorizes differently.

The epithelium found in urinary sediments is often of great importance in determining in what part of the genito-urinary

¹ It can be procured at Eimer & Amend, chemists' supplies, New York City.

tract the lesion exists, and a knowledge of the histology of these organs will sometimes prove invaluable.

The presence of echinococcus, filaria, etc., determines the exact nature in those diseases.

Dysuria is not always a manifestation of renal or vesical disease, since a high fever may at times originate it. In such cases children complain or cry out on attempting to urinate.

This symptom belongs as well to affections of the external genitals such as phimosis, urethritis, congenital anomalies of the urethra, those of the labia minora in females, etc.

Specific Gravity.—The specific gravity of the urine is best taken with a hydrometer. If the urine is very scanty an instrument called the urino-pyknometer, devised by Saxe, should be used. It has the advantage of giving the specific gravity when only 1 dram or 3 cubic centimeters can be procured.

TEST FOR ALBUMIN.

A simple and reliable test for albumin consists in heating 5 cubic centimeters of urine in a test-tube to boiling. (If the urine is not clear, it should be filtered.) If a precipitate forms after boiling, either albumin or phosphates are indicated. Three or 5 drops of very dilute acetic acid added at this time will cause the precipitate to disappear if it is due to phosphates. If the precipitate is due to albumin on the addition of the dilute acetic acid it will become more flocculent in character.

The acetic acid must be very dilute, since an excess of acid will cause the albumin to go into solution.

Directions for Use.—In testing urine for albumin with nitric acid, fill the large tube of an horismascope two-thirds full of the urine, which must be made perfectly clear and transparent, if necessary by filtration. Then pour into the funnel tube 25 to 30 minims of nitric acid, which will pass down through the capillary tube and form a layer underlying the urine. If albumin is present, a distinct white zone will presently appear at the point of contact, sharply defined against the black background, the amount of albumin being indicated by the density of the opaque ring. Sometimes air will remain in the capillary tube of the instrument, preventing the acid from running down the tube. It is always best to see that the tube is free from air before pouring in the acid. If air is present, it can generally be driven out by

merely tilting the instrument or it may be driven down the tube by placing the thumb or middle finger on top of the funnel so as to cover it completely and pressing quickly and forcibly so as to cause a few bubbles of air to pass through the urine.

In the use of the horismascope in applying the nitric-acid test for albumin, these advantages are secured:

1. The acid when it comes in contact with the urine is of full strength, rendering the test much more delicate than as ordinarily applied.

2. The reaction is not liable to be obscured by separation of uric acid or acid urates, such separation not taking place in the horismascope until after a considerable interval.

3. The black and white backgrounds of the instrument render much more distinct the effects produced by the reagent.

The faintest visible trace of albumin as shown by the nitric acid test may be stated to be $\frac{1}{60}$ per cent. One-fourth of 1 per cent. is just sufficient to make the albumin layer opaque when viewed from above. If larger amounts are present the percentage may be approximately estimated by diluting the urine until the opacity is reduced to that corresponding with 0.25 per cent.

There are many other tests which can be advantageously made by introducing the reagent from beneath, allowing it thus to form a distinct stratum underlying the fluid to be tested.

In testing a specimen of urine it is always best to first determine its reaction. For this purpose red and blue litmus paper should always be at hand. A small piece of each kind of paper should be added to the specimen and the result be observed. If the urine is alkaline the red litmus paper will turn blue, and if it is acid the blue litmus paper will turn red. It is very important that when testing for sugar the urine should be rendered slightly alkaline with a little dilute sodium hydroxide, and when testing for albumin, slightly acid with dilute hydrochloric acid.

Robert's Albumin Test.

R Sat. sol. magnes. sulph. (c. p.) 5 ounces.
Nitric acid (c. p.) 1 ounce.

This test is a cold one, viz.: put about 1 cubic centimeter of solution into medium-sized test-tube—incline on a steady rest on an angle of 45 degrees. With a slender pipette allow the filtered urine to be tested—to flow very slowly down the side of the

tube. It will float above test solution. Use about 1 cubic centimeter of urine. Examine in front of the window by daylight, with aid of black background. A sharp clear-cut, white line will appear at contact line if albumin is present. A wide band of white is not always indicative of albumin, neither is a narrow zone above in the urine, which may be due to mucus. The sharp, clear-cut zone is distinctive.

The Diazo Reaction in Urine.—The diazo test was suggested by Ehrlich, in 1882, as a valuable diagnostic measure in typhoid fever, although he admitted the occurrence of this reaction also in tuberculosis and measles.

The diazo reaction depends upon the fact that if sulphanilic acid (amidosulphobenzol) be acted upon by HNO_2 diazosulphobenzol is formed, which unites with certain aromatic substances occasionally present in the urine to form aniline colors.

Friedenwald has recently reviewed the literature of this reaction, and showed that many of the contradictory results obtained by some observers are due to failure in carrying out Ehrlich's methods in performing the test, which is best accomplished as follows:—

To obtain diazosulphobenzol in a perfectly fresh condition sulphanilic acid is kept in solution with hydrochloric acid; to this sodium nitrate is added, whereupon HNO_2 is liberated and diazosulphobenzol is formed.

Process.—Two solutions are prepared, as follows:—

1. Two grams of sulphanilic acid, 50 cubic centimeters of hydrochloric acid, 1000 cubic centimeters of distilled water.
2. A 0.5 per cent. solution of sodium nitrite.

In performing the test, 50 parts of No. 1 and 1 part of No. 2 are mixed, and equal parts of this mixture and of the urine in a test-tube are rendered strongly alkaline with ammonia. If the reaction be positive the solution assumes a carmine-red color, which on shaking must also appear on the foam. Upon standing for twenty-four hours a greenish precipitate is formed.

The test must not be considered positive unless a distinct red coloration extends to and includes the foam on shaking.

INDICAN.

In examining urine for indican it is best to use a sample that has not been preserved with formaldehyde, since this substance interferes with this test.

Jaffe's Test.—Place 10 cubic centimeters of fresh urine and 10 cubic centimeters of concentrated hydrochloric acid in a test-tube and add 2 to 3 cubic centimeters of chloroform and a few drops of calcium hypochlorite solution, then place the thumb over the end of the test-tube and shake thoroughly. Allow the tube to stand a moment. The chloroform will settle down to the bottom of the tube and will be colored red or blue if indican is present.

Obermayer's Test.—Nearly fill a test-tube with a mixture of equal volumes of Obermayer's reagent and the urine under examination. Add 2 to 3 cubic centimeters of chloroform, place the thumb over the end of the test-tube and shake thoroughly. The chloroform will be colored red or blue as in Jaffe's test.

Obermayer's reagent is prepared by adding 3 grams of ferric chloride to a liter of concentrated hydrochloric acid.

Phenolsulphonephthalein Test for Kidney Efficiency.—The patient upon whom the test is to be performed is made to empty the bladder, and is then given a glass of water in order to assure a free flow of urine. About fifteen minutes after the water has been taken we proceed as follows: One cubic centimeter of a solution containing 6 milligrams of phenolsulphonephthalein¹ is injected intramuscularly in the lumbar region, the time of injection being noted.

One hour and fifteen minutes after the dye has been injected a full sample of urine should be collected. This sample represents the first hour, since fifteen minutes is allowed for the dye to be absorbed. One hour after the last micturition another sample of urine is collected care being taken that the bladder be emptied as completely as possible. This sample represents the second hour.

To each hour-sample of urine is added 25 per cent. NaOH, drop by drop, until the maximum intensity of color appears. This color will remain constant for an indefinite period of time. Each sample is then placed in a 1000 cubic centimeter volumetric flask and diluted to the mark with distilled water.

¹ This solution is prepared by adding 0.6 gram phenolsulphonephthalein and 0.84 cubic centimeters of 2/N NaOH to enough 0.75 per cent. NaCl solution to make 100 cubic centimeters. This gives the monosodium or acid salt which is slightly irritant locally when injected. It is necessary to add 2 or 3 drops more 2/N NaOH which changes the color to a Bordeaux red. This preparation is non-irritant.

Comparison is made in a Duboscq (Hellige or Sargent) colorimeter with a standard consisting of 3 milligrams of phenol-sulphonephthalein in 1000 cubic centimeters of solution. The cylinder containing the standard may conveniently be placed at the 10 millimeter mark. Since the volume of each urine sample is the same as that of the standard, the percentage elimination of phenolsulphonephthalein in each may be easily calculated as follows:—

Reading of Urine: Reading of Standard: 100:X.—The amount of the drug eliminated normally is 40 to 60 per cent. during the first hour and 20 to 25 per cent. during the second hour, or a total of 60 to 85 per cent. for two hours. The amount of the drug excreted has been found to be independent of the quantity of urine obtained. In case of delayed excretion the collection of hourly samples may be continued until practically all of the drug has been recovered in the urine.

If it is desired to test the function of each kidney separately, ureteral catheterization must be resorted to, the experiment otherwise being performed as above described.

The phenolsulphonephthalein test may be used to indicate the amount of derangement in quantitative functional disturbance of the kidneys, as in chronic interstitial and chronic parenchymatous nephritis or uremia.

TESTS FOR SUGAR (GLUCOSE) IN URINE.

Benedict's Test.—To 5 cubic centimeters of Benedict's solution in a test-tube add 7 to 9 drops (not more) of the urine under examination. Boil for two minutes and allow the tube to cool. If glucose is present the entire body of the solution will be filled with a precipitate which may be red, yellow, brown or green.

If only 1 per cent. of glucose is present the copper deposit will not be so great, but the solution will be definitely turbid. As small an amount as 0.02 per cent. will give a turbidity to the solution.

Benedict's solution has the following composition:—

| | |
|------------------------|---------------------|
| Copper sulphate | 17.3 grams. |
| Sodium citrate | 173.0 grams. |
| Sodium carbonate | 100.0 grams. |
| Distilled water | to make 1000.0 c.c. |

This test has the advantage over the other sugar tests in that it can detect a smaller amount of glucose. Fehling's solution which is so widely used contains strong alkali, which when boiled with urine containing only a small amount of sugar will fragment the small amount present and no copper will be reduced.

Nylander's Test.—Solution is composed of 2.0 grams bismuth subnitrate, 4.0 grams Rochelle salt, and 100.0 grams of an 8 per cent. solution of sodium hydrate. One part of this solution added to 9 parts by volume of the urine and the mixture boiled for a time. The reaction begins as a grayish black coloration of the whole mixture, which soon becomes a deep black.

This test is a delicate one, and it reveals sugar in ordinary urines in amounts of 0.05 per cent., in concentrated urines only in amounts of 0.1 per cent. upward. A faint reaction may be produced even in non-saccharine urines, especially when drugs such as rhubarb, and senna, antipyrin, salicylic acid, camphor, chloroform, chloral hydrate, saccharine, and turpentine have been ingested. All of these substances may reduce cupric and bismuth oxide to a certain degree.

Fermentation Test.—With the aid of a saccharometer we have a convenient method of estimating the quantity of sugar in the urine. A piece of yeast-cake about the size of a pea is added to a test-tube of urine, and allowed to stand at a temperature of 90° F. If sugar is present, yeast transforms it into alcohol and carbon dioxide, by fermentation. While this test is reliable, it is not a very delicate one.

BLOOD.

Heller's Test.—Urine is rendered strongly alkaline with potassium hydrate and boiled. On cooling the blood coloring matter is carried down with the precipitated earthy phosphates and tinges the latter (which otherwise appears as white flocculi) brownish or garnet red.

Fallacies.—Earthy phosphates may be deficient in the urine and no deposit result. To obviate this add two drops of calcium chloride solution.

Reactions due to such substances may be differentiated from the true blood reactions by the fact that both are precipitated and the pigment of the former reaction disappears when treated with acetic acid, whereas if the color is due to the hematin of the

blood the acid will only dissolve the precipitate of phosphates and leave the pigment undissolved.

Certain drugs, as rhubarb, senna, santonin, give a similar reaction.

Guaiacum Test.—Place 5 cubic centimeters of urine in a test-tube and add drop by drop of a freshly prepared solution of tincture of guaiacum until a turbidity results. Then add hydrogen peroxide drop by drop until a blue color is obtained, which indicates the presence of blood.

Fallacies.—(1) Pus gives a similar color, but it is more green than blue, and appears more slowly.

(2) Iodides in urine give a similar blue color, but it appears more slowly than with blood.

PUS.

The deposit is opaque and white; in small quantities it may be mistaken for mucus; in larger quantities for phosphates or for colorless urates: urates disappear on warming—pus remains—phosphates increase with heat, but clear up with acetic acid.

Microscopical Detection of Pus.—The characteristic formed elements of pus are leucocytes. The urine should be examined under the microscope and if any considerable number of leucocytes are seen a pathological urine is to be suspected. Sometimes it is impossible to differentiate between pus cells and certain types of epithelial cells which have desquamated. In such a case apply the test given below.

Hawk recommends the addition of iodine solution, (I in KI) to stain the material under examination. The pus corpuscles will be stained a deep mahogany-brown and transmit to epithelial cells a light-yellow tint.

The addition of dilute acetic acid will differentiate red and white blood cells. If red cells are seen microscopically add the dilute acetic acid to the sediment. The acid will dissolve the red cells and leucocytes, if present, will be readily discernible.

Liquor Potassæ Test.—To 1 cubic centimeter of the suspected deposit in a test-tube add a few drops of liquor potassæ; pour the mixture from one test-tube into another. Pus will have partially dissolved, and become ropy and gelatinous.

Fallacy.—The test will not detect small quantities of pus.

DIACETIC OR ACETOACETIC ACID TEST.

Gerhardt's Iron Chloride Reaction.—To 5 cubic centimeters of urine in a test-tube add liquor ferri perchlor (B. P.) drop by drop; a white precipitate of iron phosphate forms first, but almost immediately if acetoacetic acid be present, the liquid becomes deep purple-red, the color being discharged again on warming.

ACETONE TEST.

Legal's Test.—A few drops of a fresh solution of sodium nitroprusside are added to the urine and a saturated sodium hydrate solution until a distinct alkaline reaction is produced. After the purple color produced by their addition has been succeeded by a pale yellow, carefully add a few drops of a saturated acetic acid. If a bright purple or carmine color appears, the presence of acetone is proven. In the absence of acetone, the pale yellow color will persist.

BILE PIGMENTS.

Gmelin's Test.—To about 5 cubic centimeters of concentrated nitric acid in a test-tube add an equal volume of urine carefully with a pipette down the side of the tube so that the two fluids will not mix. At the point of contact various colored rings will appear. These may be green, blue, violet or red. In the absence of bile pigments there will be no color display.

CHLORIDES.

The tests for chlorides are dependent upon the formation of silver chloride on adding a solution of silver nitrate to a urine previously acidulated with strong nitric acid. This is to prevent the formation of silver phosphate. A ten per cent. solution of the silver salt is used, and an exactly similar test is to be made on normal urine as a control. Any reduction in an amount sufficient to be of diagnostic value can be made out by the difference in bulk of the precipitate of silver chloride formed in the two test-tubes. Albumin must be removed before applying the test.

V.

BACTERIOLOGICAL MEMORANDA.¹

DEMONSTRATION OF TUBERCLE BACILLI IN SPUTUM.

WITH a forceps pick out a thick, purulent portion of the sputum. Make a thin spread between a slide and a cover-glass. Allow this to dry thoroughly in the air or it can be dried by holding it several inches above a Bunsen burner. Stain with several drops of Ziehl's solution and heat it over a Bunsen burner:—

Ziehl's solution:—

| | |
|---------------------|------------|
| R Fuchsin | 1 gram. |
| Alcohol | 10 grams. |
| Carbolic acid | 5 grams. |
| Water | 100 grams. |

Ziehl's solution should be allowed to act for at least three minutes, constantly heating the slide so that steam rises. Replenish the dye as necessary while heating. After three minutes pour off the dye and wash the slide in water. Then place the slide in a solution of 3 per cent. concentrated hydrochloric acid in absolute alcohol until the film becomes colorless (30 seconds to 1 minute). Wash in water and counterstain with Löffler's alkaline methylene blue solution for 30 seconds. Wash in water, blot, dry and examine. The tubercle bacilli, being both alcohol and acid fast will retain their original stain, red, and will not take the blue.

Aqueous Solutions.—Aqueous solutions of methyl violet, gentian violet, fuchsin, and the other aniline dyes are prepared by adding 1 cubic centimeter of the saturated alcoholic solutions of the desired dye to 20 cubic centimeters of distilled water. This will impart a decided color to the liquid so that a pipette full will be barely transparent.

The true aqueous solutions are made by dissolving the dyes in water, but these are weak and not so effective as those prepared from the alcoholic solutions. These solutions deteriorate in a short time. The carbol-fuchsin and alkaline methylene blue will keep a little longer, but they require to be filtered occasionally.

¹ The reader is referred to works on bacteriology (such as Park and Williams) for blood examinations in malaria, anemia, leukemia, and for the Widal reaction of the blood in typhoid fever.

GONOCOCCUS.

With a platinum loop pick out a thick purulent portion of the discharge. Make a thin spread between two slides. Dry in the air or over a Bunsen burner. Cover the preparation with fresh or freshly filtered aniline water gentian violet solution. Allow to act just three minutes. Pour off the solution and blot the remainder. Immediately cover with Lugol's solution (I in KI). Do not allow the film to dry at any stage of the staining. Let the Lugol's solution act for exactly two minutes, pour off at the end of that time, blot, and rinse the preparation in absolute alcohol for from thirty seconds to a minute, or until most of the dye has been washed out. Then place the slide in fuchsin solution for exactly 30 seconds. Wash in water, dry, and examine under oil immersion lens. The gonococci will be stained red and will be intracellular. Unless the organisms are Gram-negative, that is, have taken the counterstain, and they are found in pus cells, are D-shaped, and appear in pairs, the diagnosis of gonococcus infection should not be made positively.

Cover preparation with aniline gentian violet solution (preferably fresh) for five minutes, pour off excess of stain and cover with Gram's solution for two to five minutes.

GRAM'S SOLUTION.

| | |
|------------------------|------------|
| R Iodine | 1 gram. |
| Potassium iodide | 2 grams. |
| Distilled water | 100 grams. |

Decolorized with 95 per cent. alcohol until no further traces of the stain can be washed out of the preparation. Wash in water and counterstain with an aqueous contrast stain, preferably Bismarck brown. Wash in water, dry and examine under oil immersion lens. The gonococci will take the counter stain.

DIPLOCOCCUS PNEUMONIÆ.

The mouth should be thoroughly rinsed before taking sputum for examination, because the *Pneumococcus* Type IV is a normal inhabitant of the mouth cavity. After rinsing, then, to avoid error, the patient's sputum is taken and a smear made as previously described. The slide is stained by Gram's method in precisely the same manner as for gonococci. If diplococci *pneumoniæ* are present, characteristic pairs of lancet shaped cocci will be seen. They will be Gram-positive, that is, they will not take the fuchsin counter-

stain, but will retain their original purple stain. With Hiss's Capsule Stain this organism shows a well defined capsule.

With a platinum loop pick out a thick portion of the sputum. Make a thin spread between two cover-glasses. Immerse in a watch-glass of aniline gentian violet for ten minutes. Pass through water, and place in Gram's iodine solution for five minutes. Wash in alcohol until no further color comes away. Place on edge to dry. Mount in Canada balsam.

KLEBS-LOFFLER BACILLUS.

Bacteriological method of diagnosis is given in detail in chapter on Diphtheria. Bacillus stains well with Löffler's alkaline methylene blue.

STREPTOCOCCUS.

Usually found in purulent ear, eye, or nasal discharges, sometimes in vaginitis.

With a platinum loop pick out a thick portion of the discharge. Make a thin spread between two slides. Dry in the air or over a Bunsen burner. Stain with methylene blue or fuchsin solution. Mount in Canada balsam.

Streptococci appear as Gram-positive organisms, growing in chains, often as many as twenty cocci in one chain.

MENINGOCOCCUS.

Lumbar puncture fluid in cerebrospinal meningitis should be spread between two cover slides and dried over a Bunsen burner. Stain and mount as for gonococcus. Meningococci are Gram-negative, biscuit shaped cocci, generally intracellular.

STAPHYLOCOCCUS.

Staphylococci are found in carbuncles, boils, purulent conjunctivitis, tonsils, osteomyelitis, and in some less common pus conditions.

Purulent material may be stained in the same way as described above. Staphylococci grow in clusters resembling bunches of grapes. They are Gram-positive cocci.

Gram Solution.—Take 3 to 5 cubic centimeters of aniline oil, preferably Kalbaum's, 9 cubic centimeters of distilled water, and 7 cubic centimeters of Absolute Alcohol and shake vigorously for

two minutes. Filter through a good quality filter paper. The filtrate should be absolutely clear. To the filtrate add 2 grams of Grubler's powdered gentian violet. Set aside for 24 hours. This will keep for 6 weeks but the solution should be filtered from time to time.

Lugol's Solution.—Dissolve 2 grams of KI in a little distilled water, then add 1 gram of iodine, then add 100 cubic centimeters of distilled water.

Carbol Solution.—This is made by dissolving 2 grams of fuchsin in 100 cubic centimeters of distilled water. Some bacteriologists prefer to use Bismarck-Brown as the counterstain instead of fuchsin, especially in examining pus, for the reason that the fuchsin sometimes overstains a pus film. The solution of Bismarck is prepared by dissolving two drams of Bismarck-Brown in 100 cubic centimeters of distilled water.

VI.

ANESTHESIA.

TYPES OF ANESTHETICS.

BEFORE giving an anesthetic or resorting to any operation in which an anesthetic is required certain preliminaries must be considered. If we are dealing with a child suffering with bronchitis or an inflammatory condition of the air tracts, then ether is contraindicated. In such cases rapid anesthesia can best be accomplished by using ethyl chloride or ethyl bromide. If sprayed on a mask with sufficient air, rapid anesthesia occurs with very little danger.

The pulse should always be supervised no matter what form of anesthesia is given. The urine should be examined to determine the condition of the kidneys, and if severe albuminuria is noted ether is contraindicated, and chloroform should be cautiously administered by the drop method.

There is considerable danger of the development of acidosis following prolonged anesthesia. Such acidosis is usually the result of carbohydrate starvation and can best be guarded against by feeding cereals such as wheaten, oatmeal and farina.

There is always danger of a pneumonia or capillary bronchitis following ether anesthesia. We can guard against the same by thoroughly ventilating and oxygenating the lungs. The recumbent position should be avoided when possible and the patient changed from side to side. By this means we avoid hypostatic congestion. In cases of empyema we must carefully weigh the dangers of a general anesthesia and when possible use local anesthesia for a thoracotomy.

Before resorting to an anesthetic one should always have strychnine tablets, adrenaline chloride, and whiskey ready for hypodermic stimulation. If the heart beat ceases $\frac{1}{60}$ grain strychnine should be combined with ten minims of whiskey and injected hypodermically or intravenously, to be repeated in one minute if no response is noted. Massage with two fingers over the apex of the heart, immediately under the left nipple, should be given. Artificial respiration, with the windows open should be continued until respiration is regularly established.

Nitrous Oxide and Ether.—The ideal anesthetic for children is a combination of nitrous oxide and ether. Whenever it is possible *one skilled in its administration should be employed.* The responsibility of attending to a major or minor operation is so great that unless *one skilled in the administration of an anesthetic* is employed there may be serious after-effects. To properly guard the heart and respiration requires experience, and no surgeon should undertake to do both, excepting in extreme emergencies.

Walter K., 5 years old, was given a mixture of nitrous oxide and ether by T. Culler. The child was anesthetized without a struggle. The adenoids

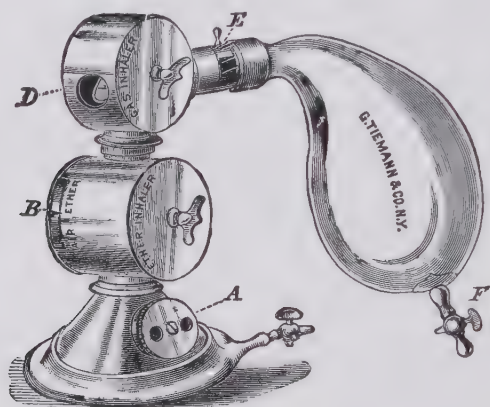


Fig. 293.—Gas and ether inhaler.

and hypertrophied tonsils were removed. The child showed no evidence of shock. There was slight nausea. No other evidence of gastric disturbance. There were no after-effects.

Chloroform.—Chloroform vapor is decomposed into chlorine and hydrochloric acid by the presence of the common gas flame, and may thus give rise to irritating effects upon the respiratory organs.

When employed it should be administered by the drop method. By this method, combined with fresh air, the danger is minimized. The statistics of George Gould, of Philadelphia, and the Lancet Commissioner, prove that chloroform anesthesia causes more deaths than ether as an anesthetic.

Ethyl Chloride.—This is an excellent anesthetic and can be administered as a spray on a chloroform mask. I have frequently used it in my hospital service to remove adenoids, tonsils, and for a circumcision. Ethyl chloride is a rapid and safe anesthetic.

Local Anesthesia.—Ethyl chloride, as a spray, until the part is frozen, is sufficient to open an abscess, for a lumbar puncture, or even an empyema, in a sensitive child or where general anesthesia is contraindicated.

The inhalation of ethyl chloride is also of great advantage where a *short anesthesia* is required, as, for instance, when a paracentesis of the ear is to be made. An advantage of ethyl chloride over ether or chloroform is that it is not followed by nausea or vomiting.

Ether.—Sulphuric ether, used alone as an anesthetic in children, may be considered. It requires a much longer time to produce its effect, although it has no depressing effect upon the heart. Statistics show that in 300,175 administrations of ether there were 18 deaths. Out of 638,461 of chloroform, there were 160 deaths, showing the following ratio:—

| | |
|----------------------------|-------------|
| Chloroform mortality | 1 to 3,749. |
| Ether mortality | 1 to 16,675 |

We therefore see that ether is by far the safer anesthetic. Weir states that ether narcosis is safer, even though the kidneys are slightly affected. Ether is frequently combined with oxygen, and, as previously stated, with laughing gas, and forms in the latter combination *the safest anesthetic for children*.

Regarding the Effect of Ether in Affections of the Air Passages.—Affections of the air passages following ether narcosis are usually the result of aspiration of infected mouth contents. Ether causes a slight increase of mucous secretion. It has no irritant action on the tracheal or bronchial mucous membrane. When bronchitis or pneumonia exists, greater care must be taken owing to the increased secretion produced by the ether, as stated above. When nitrous oxide is given we avoid the irritant effect just described.

In adenoid operations, give nitrous oxide until cyanosis is seen, then give ether; the change relieves cyanosis at once.

Lymphatic Enlargement in Children.—Most deaths occur in children in which the lymphatic condition exists—the so-called lymphatic diathesis.

The Children's Clinic at Graz, during the last twenty years, shows that records of fatalities with chloroform always revealed the lymphatic hyperplasia, which is the principal feature of the so-called *constitutio lymphatica*. (Read chapter on *Status Lymphaticus*.)

Ewing believes the above conditions prevail in America. Lartigan's report of the Roosevelt Hospital shows that death came after

ether as well as after chloroform, in children affected by the lymphatic constitution.

The presence of universal enlargement of the lymph nodes without direct inflammatory cause, hypertrophied tonsils, adenoid hyperplasia, tendencies to anemia, weakness of pulse, irregular heart's action, along with insufficient development of the heart and large blood-vessels, show that the lymphatic condition exists.

LOCAL OR INTRA-SPINAL ANESTHESIA.¹

Corning, of New York, about thirty years ago found that anesthesia could be produced in the lower part of the body by injecting cocaine in the lumbar region of the spine. The patient is placed in a sitting position well bent forward, and firmly held during the injection. The skin should be cleaned in the usual antiseptic way, followed by an ethyl chloride spray. This renders the introduction of the needle practically painless. A point one-half inch to either side of the median line and midway between the spinous process is taken, and the needle pushed forward, inward, and upward. Special effort is made to keep away from the central part of the spinal canal by a close relation of the needle point to the dura. The instrument used is of the simplest kind. A small-sized, steel aspirating needle with a short-beveled pointed end, having a well-fitted hypodermic barrel, answers every purpose. As nearly as possible the same amount of cerebrospinal fluid is allowed to escape as of the injection medium which is to be introduced. The injection is given slowly, usually taking one and one-half to two and one-half minutes. Often the first evidence that the cocaine is taking effect is some dilatation of the pupils or a slight nausea.

Since the introduction of novocaine we have a much safer local anesthetic. Owing to its being less toxic than cocaine we do not have the disagreeable constitutional symptoms so prevalent during the administration of cocaine. There is an absence of nausea and vomiting and an absence of the dilatation of the pupils.

The clinical researches of Braun and Bier have demonstrated that novocaine produces more profound and more lasting anesthesia than cocaine. When applied locally it has no irritating qualities. From one-half to 1 cubic centimeter of the 1 per cent. novocaine-suprarenin was sufficient to produce complete anesthesia for four hours.

¹ The technic of lumbar puncture is described in article on Meningitis (page 944).

Novocaine¹ offers our best means of producing local anesthesia. This drug produces far less toxicity than cocaine. It is dispensed in ampules. Novocaine produces no by-effects and causes no mydriasis.

This method has been especially valuable where circumcision is to be performed, or where the examination of the bladder is to be made. In children I have frequently found considerable nausea and vomiting following the use of cocaine; the same is also true of eucaïne. The analgesic effect of eucaïne is in some cases as good as that of cocaine.

Dose Required.—Five, rarely 10, minims of freshly prepared 2 per cent. novocaine solution are required. The solution should be freshly prepared for each case, by dissolving the novocaine.

¹ Novocaine ampules can be procured from H. A. Metz & Co., New York. Each ampule contains 2 cubic centimeters.

VII.

DISINFECTION.

THE modern conception of the transmission of such infectious diseases as diphtheria, scarlet fever, measles, and cerebrospinal meningitis has resulted in a complete reversal of the methods of fumigation, isolation, and quarantine. The Health Department of the city of New York, in July, 1913, issued orders that: On account of the practical absence of danger from bedding used by the patient, the removal of such bedding for disinfection after the termination of cases of diphtheria, scarlet fever, measles, cerebrospinal meningitis and poliomyelitis should be discontinued. In exceptional instances where the family or physician insist upon sterilization of bedding, it will still be performed by the department. In special cases, where proper and efficient fumigation cannot be performed by reason of the nature of the premises, bedding will be removed after the termination of these diseases, and bedding will also be removed in cases of smallpox.

The best disinfectant is sunlight and fresh air. There is no danger from the air of the room in which the patient suffering from diphtheria is confined. There is danger in the secretions from the nose and mouth, or if there is a mouth to mouth contact with a patient suffering from diphtheria.

The *presence of insects in the sick room*, especially flies, should be guarded against as much as possible, in view of the fact that they may act as carriers of the disease. No food should be allowed to stand uncovered in the sick room, as in certain cases pathogenic organisms may gain access and multiply therein.

Sputa are best disinfected by steam sterilization, together with the sputum cups. The addition of 15 grams of sal-soda to a liter of water materially aids the process of cleaning.

Urine and feces are best treated together by means of milk of lime. In this we possess the most valuable agent for the disinfection of typhoid and cholera stools. This agent is prepared as follows: To unslacked lime, placed in a jar, as much water as it will absorb is added. The unslacked lime is stirred up with 4 parts of water to form the milk of lime, and this is mixed intimately with the dis-

charges until the mixture gives a strong alkaline reaction (tested by litmus paper).

Chloride of lime, to be effective, must contain 25 per cent. of available chlorine. Six ounces to the gallon of water represents the standard solution.

Carbolic acid, unless in combination with sulphuric, and corrosive sublimate are *not suitable* for the disinfection of stools.

Discharges can also be disposed of by burning after being mixed with sawdust.

Water-closets are best disinfected by chloride of lime solution.

VIII.

THE ADMINISTRATION OF DRUGS.

WHAT is the dose of a given drug in a child? The dose is the one that produces results. Thus calomel in $\frac{1}{10}$ of a grain may produce the effect desired while in another case ten times the dose may be necessary. This will be illustrated later on in connection with the dose of strychnia.

1. Begin with the minimum dose of a drug such as $\frac{1}{10}$ of a grain of calomel, increase until $\frac{1}{5}$ of a grain or $\frac{1}{4}$ has been given. Many children have stomatitis after calomel and therefore should be watched for the same.

2. Always try to give palatable medicine. A pleasant menstruum such as orange syrup or raspberry syrup or lemon syrup will prevent nausea from a bad tasting drug.

3. Tablet triturates flavored with wintergreen or peppermint is a good means of disguising drugs such as iodide of sodium.

4. Belladonna, calomel, quinine, strychnia and alcohol can be given in very large doses. Note the physiological effect of the drug and continue until its point of tolerance is reached. In diphtheria or septic pneumonia or septic scarlet fever I have given $\frac{1}{50}$ of a grain of strychnia without effect, gradually increasing the dose until $\frac{1}{40}$, $\frac{1}{30}$, $\frac{1}{20}$, $\frac{1}{10}$ of a grain was given. Such large doses are rarely necessary but should be remembered when specific results are desired in septic cases.

5. Anaphylaxis frequently follows the administration of foreign proteins. This is especially important when giving injections of antitoxin for immunizing purposes or for the specific effect in diphtheria. To guard against the anaphylactic reaction when administering diphtheria antitoxin, it is a good plan to inject about 1 cubic centimeter of antitoxin, note its effect, and one-half hour later, give the desired dose of 5000 or 10,000 units. It is self understood that if any anaphylactic reaction is noted, we should not administer the large dose of antitoxin.

6. Castor oil, so necessary in children, should always be preceded by orange juice. Many children will take codliver oil if we promise a small bit of chocolate before and after taking the oil.

7. *Concerning the use of alcohol:* In septic diseases such as typhoid, pneumonia, diphtheria, scarlet fever, whiskey is necessary.

Although prohibition is in force, good whiskey can be procured and should be combined with strychnine when necessary. Many lives have been saved during my service at the Willard Parker Hospital and at the Riverside Hospital when stimulation so necessary to a weakened heart was properly administered.

HYPODERMIC MEDICATION.

In croup, when it is necessary to induce vomiting, the hypodermic administration of $\frac{1}{10}$ of a grain of apomorphia is advisable. It may be repeated every fifteen minutes until effectual. Many drugs such as strychnia can be given as well hypodermically.

In asthmatic bronchitis the hypodermic administration of 3 to 5 minims of 1:1000 solution of adrenaline chloride will check asthmatic wheezing promptly. When adrenaline is administered by mouth, the same effect is not obtained.

Pituitrin in 5- to 10- minim doses given hypodermically has an excellent effect on the intestinal mucosa. It stimulates peristalsis and is therefore adapted in the diagnosis of intestinal obstruction. (See Symptoms and Treatment in chapter on Intestinal Obstruction and Intussusception.)

INTRAMUSCULAR INJECTION.

In the treatment of syphilis, the requisite dose of salvarsan or neo-salvarsan can be injected into the gluteal muscles without causing systemic disturbances. It is a rapid and convenient method of giving anti-luetic treatment in children. When it is necessary to introduce salvarsan rapidly then the longitudinal sinus can be used but when objection is raised to this method, then the most convenient place is the thigh, in children.

IX.

RECTAL MEDICATION IN CHILDREN.

WHEN the stomach is irritable in young children I prefer to medicate per rectum. The gastric mucous membrane will sometimes show an intolerance for drugs. It is advisable, especially in exhaustive diseases, such as diphtheria, typhoid fever, and the intestinal disorders, to support the strength of the body with nutrition. In such cases vomiting may be provoked by the administration of drugs. Children will frequently object to taking medicine, and it is painful to watch the struggle between mother and child while attempting to force the medicine into the infant's mouth. In such cases, especially in very young infants with whom we cannot reason, the rectum should be chosen as the proper channel for the introduction of the drug. The rectum absorbs slowly but surely.

The following drugs may be given per rectum and the doses gradually increased:—

Aconite may be given in suppository, but shows its action only in large doses. We must therefore administer it in repeated small doses to obtain its effect. For example, we may give 1 or 2 drops of the tincture in a suppository to a year-old child.

Belladonna acts as an excellent sedative in cough, and exerts a very favorable influence on the muscle fiber of the intestine. We may use $\frac{1}{6}$ minim of extract of belladonna in twenty-four hours, divided into three or four suppositories, for every two years of age.

Bromides should be given in doses of 3 grains for each year of life, in two suppositories. In severe spasm we may give two grains for each year of life, in two suppositories rapidly following each other; for example, in laryngismus stridulus.

Caffeine is usually injected subcutaneously. It may, however, be administered in a suppository with equal parts of benzoate of sodium. For example, one and one-half grains to a suppository, using two daily for each year of the child's life.

Digitalis.—Powdered digitalis is with difficulty absorbed by the rectum. The tincture should, therefore, be used. The maximum dose for each year of life is 4 drops, divided into two suppositories.

Iodine and its preparations are exceptionally well borne by the rectum, and fully absorbed. Three grains for each year of life,
(1088)

in two suppositories, is the maximum dose; $\frac{3}{4}$ grain if it is to be continued.

Mercury should only exceptionally be given per rectum, and then only in the form of calomel, $\frac{3}{4}$ grain in a suppository for each year of life.

Nux Vomica.—One-sixth of a grain for every two years, in three suppositories.

Strychnine should only be given to children over 10 years of age. $\frac{1}{100}$ grain gradually increased to $\frac{1}{50}$ grain.

Salicylic Acid.—Two grains for each year of life. Four doses per day.

Quinine is best given in suppositories. The daily maximum dose is 2 to $3\frac{1}{3}$ grains, in two suppositories, for each year of life.

Antipyrine may be given in the same dose as quinine.

Opium.—Pulvis opii may be given in suppositories, in doses of $\frac{1}{25}$ grain for each year of the child's age, and this dose may be repeated in severe cases every two hours.

Toxic symptoms should be carefully watched for, and the use of the remedy discontinued on their appearance. These doses are small ones and may be increased.

X.

LOCAL REMEDIES.

COLD COMPRESSES.

Cold compresses may be made out of linen or cheesecloth folded several times and wrung out in ice-water. If there is any abrasion of the skin, 1 part of glycerine should be added to every 5 parts of water. If constant cold is wanted, compresses should be changed frequently.

HOT COMPRESSES OR FOMENTATIONS.

Hot compresses or fomentations are made by wringing out a piece of flannel in hot water. As this is oftentimes hotter than the hands can stand, the flannel may be placed in a towel, two ends being kept from the water and then wrung out in the towel by twisting the ends. In applying fomentations they should not be hotter than can be borne by the face of the mother or nurse. To retain the heat they may be covered with oil silk, oil paper, or oiled muslin, and then with a dry towel. Renew when cool.

POULTICES.

A poultice is intended to supply heat for a greater period than a fomentation. It should not be more than one-half inch in thickness.

A flaxseed poultice is made as follows: A sufficient quantity of water is heated, and when brought almost to the boiling point the flaxseed meal should be added slowly, stirring all the while to avoid lumping. The meal may be added until it has the consistency of hot mush, too thick to flow. This may be spread on a piece of linen or cotton cloth, the edges turned over slightly and the part to which it is to be applied next to the body must be covered with an old handkerchief or thin piece of linen. See that it is not hot enough to burn the skin. The poultice should be larger than the affected area. Afterward cover with oil silk or paper to keep out the air, and then bandage in place. This can be renewed every hour or so. Have everything ready when the poultice is made, as it quickly cools when exposed to the air.

TURPENTINE STUPES.

Turpentine stupes are found very useful in cases of abdominal pain. A piece of flannel is wrung out in hot water, the same as in a fomentation, except a little soap or oil added to the water. A little turpentine should then be sprinkled evenly over the surface of the flannel, about 30 drops to each square foot or a teaspoonful may be added to the water. Apply the same as a fomentation.

MUSTARD PLASTERS.

Mustard plasters for infants should be made with 1 part of mustard to 3 or 4 parts of flour or flaxseed meal. Add warm water and stir until of the proper consistency. Spread thinly on a cloth and apply directly to the skin. It is to be kept on until the skin is reddened, not blistered.

GINGER POULTICE.

Ginger poultice is made in the same way as that described for the making of mustard plasters, and has its advantages in that it will not blister.

CANTHARIDAL COLLODION.

In using the cantharidal collodion care should be exercised to remove all moisture and excretions from the skin before applying, otherwise the cantharidin, being soluble in water, will not come into contact with the skin. One of the most convenient methods of preparing the skin for the application of cantharidal collodion is to wash the part with vinegar or dilute acetic acid.

VENESECTION OR PHLEBOTOMY.

Local blood letting is frequently a valuable therapeutic aid, especially in meningitis and in cerebral pneumonia, in fact wherever symptoms of cerebral hyperemia are noted. Convulsions are sometimes prevented by relieving congestion with the aid of phlebotomy.

Baginsky advises venesection as a routine measure in certain types of diseases, such as continued convulsions. The vein at the elbow, the jugular or the longitudinal sinus is adapted for this purpose.

DRY CUPPING.

The application of dry cups is useful in marked dyspnea. It is therefore indicated in asthma, bronchopneumonia, and in pulmonary edema, two cups may be applied on each side posteriorly for several minutes. If relief is afforded, they can be applied once every twelve hours.

XI.

DOSAGE OF DRUGS.

For hypodermic use the dose should be half that used by the mouth. For use by the rectum the dose should be twice that used by the mouth.

Dose for Children.—Add 12 to the age and divide the result by the age.

Example.—For a child two years old, $\frac{12+2}{2} = \frac{1}{7}$. The dose should be $\frac{1}{7}$ that for an adult.

In giving powerful medicines, such as opium or morphine, still smaller doses must be used for children.

TABLE OF DOSES.

Owing to the toxic effect, drugs marked * must be given with greater caution.

| Remedies. | Infantile. | Child of 2 Years. |
|---|--------------------|----------------------|
| *Acid, benzoic | $\frac{1}{2}$ gr. | 1 gr. |
| boric | $\frac{1}{2}$ gr. | 1 gr. |
| camphoric (to check night sweats) | $\frac{1}{4}$ gr. | $\frac{1}{2}$ gr. |
| gallic | 1 gr. | 2 gr. |
| gallic (in albuminuria) | 1 gr. | 2 gr. |
| hydrobromic (diluted) | 1 m. | 2 m. |
| hydrochloric (diluted) | 1 m. | 2 m. |
| *hydrocyanic (diluted) | $\frac{1}{7}$ m. | $\frac{2}{7}$ m. |
| nitric (diluted) | $\frac{1}{2}$ m. | 1 m. |
| nitrohydrochloric (diluted) | 1 m. | 2 m. |
| phosphoric (diluted) | 2 m. | 4 m. |
| salicylic | 1 gr. | 2 gr. |
| sulphuric (aromatic) | 1 m. | 2 m. |
| sulphuric (diluted) | 1 m. | 2 m. |
| sulphurous | $\frac{1}{2}$ m. | 1 m. |
| tannic | $\frac{1}{2}$ gr. | 1 gr. |
| *Aconitina (white crystals) | 0.56 gr. | 0.28 gr. |
| Aloes | $\frac{1}{4}$ gr. | $\frac{1}{2}$ gr. |
| Aloinum | $\frac{1}{60}$ gr. | $\frac{1}{30}$ gr. |
| Ammonii benzoas | 1 gr. | 2 gr. |
| bromidum | 1 gr. | 2 gr. |
| carbonas | $\frac{1}{2}$ gr. | 1 gr. |

| Remedies. | Infantile. | Child of 2 Years. |
|---|------------------------|-----------------------|
| Ammonii chloridum | $\frac{1}{2}$ gr. | 1 gr. |
| iodidum | $\frac{1}{2}$ gr. | 1 gr. |
| valerianas | $\frac{1}{2}$ gr. | 1 gr. |
| *Amylis nitris (inhaled or internally) | $\frac{1}{8}$ m. | $\frac{1}{4}$ m. |
| Antimonii et potassii tartras (diaphoretic) | $\frac{1}{168}$ gr. | $\frac{1}{84}$ gr. |
| (emetic) | $\frac{2}{35}$ gr. | $\frac{1}{35}$ gr. |
| oxysulphuret | $\frac{1}{140}$ gr. | $\frac{1}{70}$ gr. |
| Antipyrin | $\frac{1}{2}$ gr. | 1 gr. |
| Apomorphine hydrochloride | $\frac{1}{140}$ gr. | $\frac{1}{70}$ gr. |
| Argenti nitras | $\frac{1}{84}$ gr. | $\frac{1}{42}$ gr. |
| *Arseni iodidum | $\frac{1}{168}$ gr. | $\frac{1}{84}$ gr. |
| *Atropinæ sulphas | $\frac{1}{1680}$ gr. | $\frac{1}{840}$ gr. |
| *Auri et sodii chloridum | $\frac{1}{168}$ gr. | $\frac{1}{84}$ gr. |
| Bismuthi subnitras | $\frac{1}{2}$ gr. | 2 gr. |
| salicylas | $\frac{1}{2}$ gr. | 1 gr. |
| *Bromoform (in whooping-cough) | $\frac{1}{4}$ m. | $\frac{1}{2}$ m. |
| Caffeine | $\frac{1}{12}$ gr. | $\frac{1}{6}$ gr. |
| Calcii lactophosphas | $\frac{1}{14}$ fl. dr. | $\frac{1}{7}$ fl. dr. |
| Calcii chloridum hydratum | $\frac{1}{12}$ gr. | $\frac{1}{6}$ gr. |
| Camphora | $\frac{1}{12}$ gr. | $\frac{1}{6}$ gr. |
| monobromata | $\frac{1}{7}$ gr. | $\frac{2}{7}$ gr. |
| Cerii oxalas | $\frac{1}{4}$ gr. | $\frac{1}{2}$ gr. |
| Chinoidinum | $\frac{1}{20}$ gr. | $\frac{1}{10}$ gr. |
| Chloral | $\frac{1}{2}$ gr. | 1 gr. |
| Chloralamidum (hypnotic) | $\frac{1}{4}$ gr. | $\frac{1}{2}$ gr. |
| Chloroformum | $\frac{1}{2}$ m. | 1 m. |
| Chrysarobinum (eczema) | $\frac{1}{28}$ gr. | $\frac{1}{14}$ gr. |
| Cinchonidina, and its salts | $\frac{1}{12}$ gr. | $\frac{1}{6}$ gr. |
| Cocaina (locally, internally) | $\frac{1}{60}$ gr. | $\frac{1}{30}$ gr. |
| Codeina | $\frac{1}{16}$ gr. | $\frac{1}{8}$ gr. |
| *Colchicine | $\frac{1}{1680}$ gr. | $\frac{1}{840}$ gr. |
| Confectio sennæ | $\frac{1}{4}$ tsp. | $\frac{1}{2}$ tsp. |
| *Creolin (locally, internally) | $\frac{1}{140}$ gr. | $\frac{1}{70}$ gr. |
| Creosotum | $\frac{1}{56}$ m. | $\frac{1}{28}$ m. |
| Croton-chloral | $\frac{1}{70}$ gr. | $\frac{1}{35}$ gr. |
| Cupri, acetas | $\frac{2}{500}$ gr. | $\frac{4}{250}$ gr. |
| sulphas (emetic) | $\frac{1}{2}$ gr. | 1 gr. |
| *Digitalis | | |
| infusion of | $\frac{1}{8}$ fl. dr. | $\frac{1}{4}$ fl. dr. |
| tincture of | $\frac{1}{2}$ m. | 1 m. |
| *Duboisina, and its salts | $\frac{1}{2800}$ gr. | $\frac{1}{1400}$ gr. |
| *Elaterinum | $\frac{1}{280}$ gr. | $\frac{1}{140}$ gr. |
| Emetina and its salts (emetic) | $\frac{1}{40}$ gr. | $\frac{1}{20}$ gr. |
| Ergota | 2 gr. | 4 gr. |
| Ergotinum | $\frac{1}{30}$ gr. | $\frac{1}{15}$ gr. |

| Remedies. | Infantile. | Child of 2 Years. |
|---|-----------------------|-----------------------|
| *Eserina, and its salts | $\frac{1}{900}$ gr. | $\frac{1}{450}$ gr. |
| Ethyl chloride (local anesthetic) | | |
| Fel bovis purificatum | $\frac{1}{2}$ gr. | 1 gr. |
| Ferri arsenas | $\frac{1}{50}$ gr. | $\frac{1}{25}$ gr. |
| bromidum | $\frac{1}{2}$ gr. | 2 gr. |
| carbonas saccharatus | $\frac{1}{2}$ gr. | 1 gr. |
| et ammonii citras | $\frac{1}{2}$ gr. | 1 gr. |
| et ammonii tartras | $\frac{1}{2}$ gr. | 1 gr. |
| et potassii tartras | $\frac{1}{2}$ gr. | 1 gr. |
| et strychninæ citras | $\frac{1}{8}$ gr. | $\frac{1}{4}$ gr. |
| hypophosphis | $\frac{1}{2}$ gr. | 1 gr. |
| iodidum saccharatum | $\frac{1}{2}$ gr. | 1 gr. |
| lactas | $\frac{1}{2}$ gr. | 1 gr. |
| pyrophosphas | $\frac{1}{2}$ gr. | 1 gr. |
| subcarbonas | $\frac{1}{2}$ gr. | 1 gr. |
| sulphas | $\frac{1}{2}$ gr. | 1 gr. |
| sulphas exsiccatus | $\frac{1}{8}$ gr. | $\frac{1}{4}$ gr. |
| valerianas | $\frac{1}{4}$ gr. | $\frac{1}{2}$ gr. |
| Ferrum dialysatum | $\frac{1}{8}$ gr. | $\frac{1}{4}$ gr. |
| reductum | $\frac{1}{8}$ gr. | $\frac{1}{4}$ gr. |
| Gaultheria, oil of | $\frac{1}{2}$ m. | 1 m. |
| Guaiacol (constituent of creosote) | $\frac{1}{4}$ m. | $\frac{1}{4}$ m. |
| carbonas vel benzoas | $\frac{1}{2}$ gr. | 1 gr. |
| Homatropinæ hydrobromidum (mydriatic, locally) | $\frac{1}{1000}$ gr. | $\frac{1}{500}$ gr. |
| *Hydrargyri chloridum corrosivum | $\frac{1}{280}$ gr. | $\frac{1}{140}$ gr. |
| chloridum mite | $\frac{1}{10}$ gr. | $\frac{1}{4}$ gr. |
| iodidum rubrum | $\frac{1}{8}$ gr. | $\frac{1}{4}$ gr. |
| iodidum vir | $\frac{1}{80}$ gr. | $\frac{1}{40}$ gr. |
| subsulphas flavum, (emetic) | $\frac{1}{60}$ gr. | $\frac{1}{30}$ gr. |
| Hydrargyrum cum creta | $\frac{1}{20}$ gr. | $\frac{1}{10}$ gr. |
| Hydrastina | $\frac{1}{84}$ gr. | $\frac{1}{42}$ gr. |
| Hydrogenii dioxidum (10-vol. sol.). 25 to 100 per cent. antiseptic (locally) | | |
| *Hyoscine hydrobromidum | $\frac{1}{2800}$ gr. | $\frac{1}{1400}$ gr. |
| *Hyoscyaminæ sulphas | $\frac{1}{4000}$ gr. | $\frac{1}{2000}$ gr. |
| Ichthyol, (locally, internally) | 1 gr. | 2 gr. |
| Iodoformum | $\frac{1}{28}$ gr. | $\frac{1}{14}$ gr. |
| Iodol | $\frac{1}{400}$ gr. | $\frac{1}{200}$ gr. |
| Iodum | $\frac{1}{168}$ gr. | $\frac{1}{84}$ gr. |
| Ipecacuanha (expectorant) | $\frac{1}{66}$ gr. | $\frac{1}{28}$ gr. |
| (emetic) | 1 gr. | 2 gr. |
| Jalapa | $\frac{1}{2}$ gr. | 1 gr. |
| Liquor ammonii acetatis | $\frac{1}{4}$ fl. dr. | $\frac{1}{2}$ fl. dr. |
| acidi arsenosi | $\frac{1}{4}$ m. | $\frac{2}{4}$ m. |
| arseni bromidi | $\frac{1}{10}$ gr. | $\frac{1}{6}$ gr. |
| arseni et hydrargyri iodidi | | |

| Remedies. | Infantile. | Child of 2 Years. |
|---|-----------------------|-----------------------|
| Liquor potassii arsenitis | $\frac{1}{6}$ m. | $\frac{2}{6}$ m. |
| sodii arsenatis | $\frac{1}{168}$ gr. | $\frac{1}{84}$ gr. |
| ferri chloridi | $\frac{1}{6}$ m. | $\frac{2}{6}$ m. |
| dialys | $\frac{1}{4}$ m. | $\frac{2}{4}$ m. |
| potassii citratis | 1 gr. | 2 gr. |
| Lithii benzoas | $\frac{1}{14}$ gr. | $\frac{1}{4}$ gr. |
| bromidum | 1 gr. | 2 gr. |
| carbonas | $\frac{1}{4}$ gr. | $\frac{2}{4}$ gr. |
| citras | $\frac{1}{2}$ gr. | 1 gr. |
| salicylas | $\frac{1}{14}$ gr. | $\frac{1}{4}$ gr. |
| Lupulinum | $\frac{1}{14}$ gr. | $\frac{1}{4}$ gr. |
| Magnesii carbonas | 3 gr. | 6 gr. |
| citras, gran. | $\frac{1}{3}$ gr. | $\frac{2}{3}$ gr. |
| sulphas | 10 gr. | 30 gr. |
| Mangani oxidum niger | $\frac{1}{70}$ gr. | $\frac{1}{35}$ gr. |
| Methylene blue with powdered nutmeg (malarial fever) | $\frac{1}{70}$ gr. | $\frac{1}{35}$ gr. |
| Mistura chloroformi | $\frac{1}{14}$ m. | $\frac{1}{4}$ m. |
| ferri et ammonii acet. | $\frac{1}{4}$ fl. dr. | $\frac{1}{2}$ fl. dr. |
| glycyrrhizæ composita | $\frac{1}{2}$ m. | 1 m. |
| potassii citratis | $\frac{1}{4}$ fl. dr. | $\frac{1}{2}$ fl. dr. |
| rhei et sodæ | 15 m. | 30 m. |
| Morphin and its salts | $\frac{1}{100}$ gr. | $\frac{1}{50}$ gr. |
| Morrhual (derivative of codliver oil) | $\frac{1}{4}$ fl. dr. | $\frac{1}{2}$ fl. dr. |
| Moschus | $\frac{1}{4}$ gr. | $\frac{1}{2}$ gr. |
| Naphthol | $\frac{1}{4}$ gr. | $\frac{1}{2}$ gr. |
| *Nitroglycerinum (trinitrin) | $\frac{1}{14}$ m. | $\frac{1}{4}$ m. |
| Oleoresina aspidii (filix mas) single dose daily ... | 2 gr. | 4 gr. |
| Opium | $\frac{1}{14}$ gr. | $\frac{1}{4}$ gr. |
| Phenocoll hydrochloride | $\frac{1}{35}$ gr. | $\frac{2}{35}$ gr. |
| *Phosphorus | $\frac{1}{500}$ gr. | $\frac{1}{250}$ gr. |
| *Pilocarpina and its salts (use cautiously) | $\frac{1}{280}$ gr. | $\frac{1}{140}$ gr. |
| Piperazin | $\frac{1}{2}$ gr. | 1 gr. |
| Plumbi acetas | 1 gr. | 2 gr. |
| Potassii acetas | 1 gr. | 2 gr. |
| bicarbonas | 1 gr. | 2 gr. |
| bromidum | $\frac{1}{4}$ gr. | $\frac{1}{2}$ gr. |
| bitartras | 2 gr. | 4 gr. |
| chloras | $\frac{1}{4}$ gr. | $\frac{1}{2}$ gr. |
| cyanidum | $\frac{1}{1400}$ gr. | $\frac{1}{700}$ gr. |
| iodidum | $\frac{1}{4}$ gr. | $\frac{1}{2}$ gr. |
| nitras | $\frac{1}{2}$ gr. | 1 gr. |
| permanganas | $\frac{1}{14}$ gr. | $\frac{1}{4}$ gr. |
| Pulvis antimonialis | $\frac{1}{6}$ gr. | $\frac{2}{6}$ gr. |
| glycyrrhizæ compositus | 4 gr. | 8 gr. |

| Remedies. | Infantile. | Child of 2 Years. |
|--|-----------------------|-----------------------|
| Pulvis ipecacuanhæ et opii | $\frac{1}{8}$ gr. | $\frac{2}{8}$ gr. |
| jalapæ compositus | $\frac{1}{4}$ gr. | $\frac{2}{4}$ gr. |
| rhei compositus | 2 gr. | 4 gr. |
| Resina copaibæ | 1 m. | 2 m. |
| guaiaci | 1 gr. | 2 gr. |
| jalapæ | $\frac{1}{4}$ gr. | $\frac{2}{4}$ gr. |
| podophylli | $\frac{1}{84}$ gr. | $\frac{1}{42}$ gr. |
| scammonii | $\frac{1}{8}$ gr. | $\frac{2}{8}$ gr. |
| Resorcin | $\frac{1}{4}$ gr. | $\frac{2}{4}$ gr. |
| Rheum | 1 gr. | 2 gr. |
| Saccharine (substitute for sugar) | $\frac{1}{50}$ gr. | $\frac{1}{25}$ gr. |
| Salicinum | 1 gr. | 2 gr. |
| Salipyrin (antipyretic, antineuralgic) | $\frac{1}{2}$ gr. | 1 gr. |
| Salol | $\frac{1}{8}$ gr. | $\frac{2}{8}$ gr. |
| Salophen (antipyretic and antirheumatic) | $\frac{1}{6}$ gr. | $\frac{2}{6}$ gr. |
| Santoninum | $\frac{1}{14}$ gr. | $\frac{1}{4}$ gr. |
| Senna | 4 gr. | 10 gr. |
| *Sodii arsenas | $\frac{1}{150}$ gr. | $\frac{1}{75}$ gr. |
| benzoas | 1 gr. | 2 gr. |
| boras (in epilepsy) | 1 gr. | 2 gr. |
| bromidum | 1 gr. | 2 gr. |
| chloras | $\frac{1}{35}$ gr. | $\frac{2}{35}$ gr. |
| hyposulphis | $\frac{1}{10}$ gr. | $\frac{1}{6}$ gr. |
| iodidum | $\frac{1}{8}$ gr. | $\frac{2}{8}$ gr. |
| phosphas | 4 gr. | 8 gr. |
| salicylas | 1 gr. | 2 gr. |
| *Sparteinae sulphas | $\frac{1}{20}$ gr. | $\frac{1}{10}$ gr. |
| Spiritus ætheris nitrosi | 2 m. | 4 m. |
| ætheris compositus | $\frac{1}{4}$ m. | $\frac{1}{2}$ m. |
| ammonia aromaticus | 2 m. | 4 m. |
| camphoræ | 1 m. | 2 m. |
| chloroformi | 2 m. | 4 m. |
| Strontii lactas <i>vel</i> bromidum <i>vel</i> iodidum | $\frac{1}{4}$ gr. | $\frac{1}{2}$ gr. |
| *Strychnin and its salts | $\frac{1}{600}$ gr. | $\frac{1}{250}$ gr. |
| Sulphonal (best in hot mint water) | 1 gr. | 2 gr. |
| Sulphur | 4 gr. | 8 gr. |
| Syrupus ferri bromidi | $\frac{1}{14}$ m. | $\frac{1}{7}$ m. |
| ferri iodidi | 1 m. | 2 m. |
| scilla compositus | 2 m. | 4 m. |
| senegæ | $\frac{1}{4}$ fl. dr. | $\frac{1}{2}$ fl. dr. |
| sennæ | $\frac{1}{4}$ fl. dr. | $\frac{1}{2}$ fl. dr. |
| Terebene | $\frac{1}{4}$ m. | $\frac{1}{2}$ m. |
| Terpin hydrate (tonic expectorant) | $\frac{1}{4}$ gr. | $\frac{1}{2}$ gr. |
| Theobromina et sodii salicylas (diuretic) | $\frac{1}{2}$ gr. | 1 gr. |
| Thymol | $\frac{1}{28}$ gr. | $\frac{1}{14}$ gr. |

| Remedies. | Infantile. | Child of 2 Years. |
|-------------------------|------------------|----------------------|
| *Tinctura aconiti | $\frac{1}{2}$ m. | 1 m. |
| aloes | 2 m. | 4 m. |
| asafoetida | 1 m. | 2 m. |
| belladonnæ | 1 m. | 2 m. |
| cannabis | 1 m. | 2 m. |
| capsici | $\frac{1}{2}$ m. | 1 m. |

XII.

PRESCRIPTIONS FOR VARIOUS DISEASES.

Acidosis.

Large doses of soda bicarb., 1 dram, every hour with water. The diet should be restricted to cereals and milk.

Anaphylaxis.

A cutaneous test will usually determine which foreign protein causes an anaphylactic reaction. Not only food such as eggs, cereals and fish will cause this reaction, but horse hair, dander, chicken- and goose-feathers frequently give a strong reaction.

Fever.

To reduce high fever with muscular twitching give a tub bath—lukewarm, three minutes' duration, then blanket with three warm blankets until perspiration results.

Two or three grains of phenacetine can be given and repeated every four hours for a rapid reduction of temperature. This method should always be used in children with a tendency to convulsions.

| | | |
|-------------------------------|-----------------------|---------------|
| R Sweet spirit of niter | 1½ fl. drams | 6\|0 |
| Citrate of potassium | 30 grains | 2\|0 |
| Syrup of lemon | 4 fl. drams | 15\|0 |
| Aquæ | q. s. ad 2 fl. ounces | q. s. ad 60\|0 |

M. Sig.: A teaspoonful every hour. Repeat 3 doses.

For a child 3 years old; younger children ½ teaspoonful.

| | | |
|-------------------------|----------|------------|
| R Tr. aconite rad. | 16 drops | gtts. 16\|0 |
| Spir. mindererus | 2 ounces | 60\|0 |

M. Sig.: ½ teaspoonful every hour.

For a child 2 to 4 years old.

To Correct Flatulence—A Mild Laxative.

| | | |
|-----------------------|----------|------|
| R Magnesia usta | 1 dram | 4\|0 |
| Pulv. rhei | 1 dram | 4\|0 |
| Saccharum | 2 grains | 0\|12 |

M. and divide into 12 powders.

Sig.: 1 powder in a teaspoonful of water every two or three hours.

Colitis, with Flatulence.

℞ Castor oil 2 drams
 Peppermint water $\frac{1}{2}$ dram

One hour later :

Wash colon with—

Water 1 pint
 Bicarbonate of soda 1 dram

Colic, with Constipation.

℞ Calcined magnesia 1 dram
 Powd. rhubarb 20 grains
 Sacch. menth. pip. 20 grains

M. Divide into 12 powders.

Sig.: One powder every two or three hours.

Constipation in an Infant.

If maltose or sucrose has been used, substitute lactose. One dram of sugar of milk may be added to each feeding.

℞ Aromatic cascara cordial.

Sig.: Fifteen minims. Repeat in six hours if necessary.

Or :

Rochelle salts $\frac{1}{8}$ dram
 Fennel seed water 1 dram

**Constipation due to Rickets, or to an Atony
of the Intestinal Canal.**

Codliver oil.

Sig.: One-half dram, two times a day, after meals.

Or:—

℞ Calcined magnesia.

Sig.: Add $\frac{1}{2}$ dram to evening or morning bottle.

Calcined magnesia is sold in the drug stores under the name of Milk of Magnesia.

For an older child, with hard, dry stools give codliver oil, 1 dram, three times a day, also an occasional dram of Russian oil or alboline, at bedtime.

Convulsions.

Give mustard foot bath, or a tub bath to which one or two tablespoonfuls of mustard is added. After the bath wash the colon with 1 pint of soap water. Apply ice to the head or use ice cold cloths.

In an infant with a bulging fontanel and recurring convulsions, lumbar puncture will relieve intracranial pressure. Introducing a needle between the 3rd and 4th or the 4th and 5th lumbar vertebra is simple, safe and efficient. At least 20 to 30 cubic centimeters or about 1 ounce of the spinal fluid should be tapped.

Hemorrhage.

Epistaxis.—Plug nostril with cotton saturated with thromboplastine. Internally give 5 grains acid gallicum every three hours.

In secondary anemia due to hemorrhage give a blood transfusion. (Read article on Transfusion.)

Tonsillectomy.—Before removing tonsils be sure to exclude hemophilia. If we are dealing with a bleeder, or if the blood coagulation is slow then give calcium chloride, 5 grains every three hours, for one week before operation.

To Abort Acute Rhinitis.

| | |
|------------------|----------|
| Castor oil | 1 dram |
| Salol | 2 grains |

Sig.: Repeat every four hours.

To Abort Acute Tonsillitis.

| | | |
|--------------------|----------|-----------|
| R Creosote | 8 drops | gtts. 8\|0 |
| Tinct. myrrh. | 2 ounces | 60\|0 |
| Glycerini | 2 ounces | 60\|0 |
| Aquæ | 4 ounces | 120\|0 |

M. Sig.: Gargle every hour.

Acute Tonsillitis.

Tincture of Iodine 50 per cent. applied on the tonsils, once only.

| | | |
|----------------------------|---------|------|
| R Tinct. aconit. rad. | 1 ounce | 30\|0 |
|----------------------------|---------|------|

Sig.: 1 drop every hour for six doses.

For a child 1 to 5 years old.

Capillary Bronchitis.

When expectoration is viscid:—

| | | |
|---|-----------|---------------|
| R Ammon. carbonat. | 10 grains | 0\|6 |
| Syr. senega | 4 drams | 16\|0 |
| Syr. prun. virg. | 6 drams | 24\|0 |
| Aquæ camph. ....q. s. ad | 2 ounces | q. s. ad 60\|0 |
| M. Sig.: Teaspoonful in water, every two hours. | | |

Acute Catarrhal Bronchitis.

| | | |
|---|-----------|---------------|
| R Ammon. muriat. | 15 grains | 1\|0 |
| Ammon. bromid. | 20 grains | 1\|2 |
| Syr. liquorit. | 6 drams | 24\|0 |
| Tinct. opii camph. | 2 drams | 8\|0 |
| Aquæ .....q. s. ad | 2 ounces | q. s. ad 60\|0 |
| M. Sig.: $\frac{1}{2}$ teaspoonful every two hours. | | |

Asthmatic Bronchitis (Non-febrile).

Recurring asthma is usually caused by an irritant such as orris root which is found in baby powders, or by the inhalation of fine particles of feathers.

Asthmatic Bronchitis with Wheezing and Cyanosis.

To afford quick relief inject, hypodermically, every half hour, 1 minim, increased to 2 minims, of a 1 to 1000 adrenaline chloride solution.

Stimulating Expectorant.

| | | |
|--|--------------------|----------------|
| R Syr. senegæ | 20 drops | gtts. 20\|0 |
| Ammon. carbonat. | $\frac{1}{2}$ dram | 2 0 |
| Tinct. opii camphorat. | 3 drams | 12\|0 |
| Syr. toltan. | 5 drams | 20\|0 |
| Aquæ .....q. s. ad | 6 ounces | q. s. ad 180\|0 |
| M. Sig.: Teaspoonful in water every two or four hours. | | |

Pleurisy.

For cough with pain on breathing:—

| | | |
|---------------------------|-----------|-----|
| R Pulv. Doveri | 10 grains | 0\|6 |
| Pulv. ext. liquorit. | 20 grains | 1\|3 |
| Sacch. albi | 30 grains | 2\|0 |

M. ft. chart. no. xx.

Sig.: 1 powder every three hours.

Codein $\frac{1}{10}$ grain, gradually increased to $\frac{1}{4}$ grain may be given every two hours to relieve cough and promote sleep.

Pleurisy with or without Effusion.

Strapping the chest with strips of Z. O. plaster will immobilize the chest wall and relieve pain. With rest in bed, effusion as a rule, will be absorbed. If a large quantity of fluid is present, aspirate, but do not entirely empty the chest. Tapping the chest will frequently stimulate absorption.

If fever is present, with a continuation of 100° F. in the morning and 101° F. in the evening a blood count should be taken. If a polynucleosis exists, likewise a leucocytosis, then we are probably dealing with an empyema.

A roentgenogram is sometimes helpful, but not to be depended upon exclusively.

Globular Head with Distended Fontanel.

In addition to tapping the spinal canal, the lateral ventricles should be tapped. Tapping one or both lateral ventricles will relieve intracranial pressure and is one of the most efficient means of checking convulsions.

The same procedure can be repeated in 24 hours, until sufficient fluid has been withdrawn to relieve distention of the ventricles. The author has withdrawn 120 cubic centimeters at one tapping. (Read article on Meningitis.)

Pneumonia.

Reduce fever with tepid baths or packs.

Daily attention to bowels with calomel or enema.

R Tinct. aconite, 1 drop every hour, until fever is reduced.

Aid rest at night with:—

R Codeine, $\frac{1}{10}$ grain. Repeat in three hours if necessary.

Or:—

R Dover's powder, $\frac{1}{2}$ to 1 grain. Repeat in three hours if necessary.

Bronchopneumonia.

| | | |
|--------------------------|--------------------|---------------|
| R Sodium benzoate | $\frac{1}{2}$ dram | 2 0 |
| Liq. ammon. anisat. | 1 dram | 4\|0 |
| Syr. prun. virgin. | 1 ounce | 30\|0 |
| Aquæ | q. s. ad 2 ounces | q. s. ad 60\|0 |

M. Sig.: Teaspoonful every two hours.

For child 5 years old.

Influenza (La Grippe)

Begin treatment with a laxative such as:—

| | |
|------------------------|-----------|
| ℞ Calomel | 1 grain |
| Co. jalap powder | 3 grains |
| Soda bicarb. | 10 grains |

M. Sig.: For a child 2 years old. Infant 1 year, one-half the dose.

Croup (Catarrhal).

One dram of syrup of ipecac may be repeated every fifteen minutes until emesis is induced.

Or, powdered sulphate of copper, 1 grain to 2 drams of water. Do not repeat, as it is very poisonous, and usually gives quick results.

Membranous Croup.

This is diphtheria, and emetics may relieve but one should be prepared for intubation.

In recurring laryngeal stenosis the inhalation of steam impregnated with benzoin or Beechwood creosote loosens viscid secretions, and should be continued for several hours. It is unnecessary to confine the patient and steam beneath a canopy or sheet placed around the crib. The air in the room should be moist and cool.

Immunize with 1000 units antitoxin regardless of the age. If possible test for immunity, using the Schick test.

Treatment.—Mild tonsillar-pharyngeal diphtheria, inject 5000 antitoxin units. In laryngeal diphtheria with croup, begin with 10,000 units.

In septic diphtheria, intravenously inject 15 or 20,000 units, depending on the age of the child. Give one injection only.

Pertussis.

| | |
|--------------------|---------------------|
| ℞ Antipyrine | 2 grains |
| Codeine | $\frac{1}{8}$ grain |

Sig.: Every three hours until cough lessens.

Antipyrine may gradually be increased to 5 grains.

Or:—

℞ Phenacetine.

Sig.: 2 to 5 grains every three hours, by day.

℞ Codeine.

Sig.: $\frac{1}{8}$ grain gradually increased to $\frac{1}{4}$ grain, every two to three hours, at night, until cough lessens.

In severe cases :—

℞ Heroin.

Sig.: $\frac{1}{24}$ grain, given at night. Repeat in two hours.

Measles.

Pre-eruptive stage :—

Hot bath or dry hot blanket pack.

℞ Spiritus mindererus (freshly prepared).

Sig.: 1 dram, in water, every hour.

When eruption appears :—

Continue warmth and warm drinks.

Strict attention to bowels.

For cough (see ℞ Acute Catarrhal Bronchitis).

Or :—

| | | |
|------------------------------|-----------|----------------|
| ℞ Ammon. bromid. | 45 grains | 3\|0 |
| Syr. liquorit. | 6 drams | 25\|0 |
| Decoct. althæa .....q. s. ad | 2 ounces | .q. s. ad 60\|0 |

Sig.: Teaspoonful every hour, until relieved.

For a child 1 year old.

Scarlet Fever.

Necrotic, foul-smelling patches in the pharynx and tonsils can be sprayed with antistreptococcus serum, three times a day.

To reduce fever :—

| | | |
|------------------------|----------|------------|
| ℞ Tinct. aconiti | 20 drops | gtts. 20\|0 |
| Spir. mindereri | 2 ounces | 60\|0 |
| Syr. limonis | 1 ounce | 30\|0 |

M. Sig.: Teaspoonful every hour, until sweating is produced.

For a child 5 to 12 years old. Younger children, half the dose.

Itching :—

| | |
|-----------------|-----------|
| ℞ Menthol | 15 grains |
| Alcohol | 8 ounces |
| Aqua | 8 ounces |

Sig.: Apply externally every three hours.

Restoratives :—

℞ Mist. ferri et ammonii acetatis,

| | | |
|-----------------|----------------|---------|
| Glycerini | āā 1 fl. ounce | āā 30\|0 |
|-----------------|----------------|---------|

| | | |
|------------|-----------------------|----------------|
| Aquæ | q. s. ad 4 fl. ounces | q. s. ad 120\|0 |
|------------|-----------------------|----------------|

M. Sig.: A teaspoonful or more, in water, every three hours.

Or Basham's mixture may be given:—

| | | |
|-----------------------------|-----------------------|----------------|
| ℞ Tinct. ferri chloridi, | | |
| Acidi acetici dil. | āā 1 fl. dram | āā 4\|0 |
| Liq. ammonii acetatis | 6 fl. drams | 24\|0 |
| Aquæ | q. s. ad 6 fl. ounces | q. s. ad 180\|0 |

M. Sig.: Tablespoonful three times a day.

For a child 6 years old.

Scarlet Fever—Nephritis.

(Diuretic.)

℞ Acet-theocine or Diuretin .

Sig.: 5 to 10 grains, every three hours.

Vaginitis Following Scarlet Fever.

℞ Solut. argyrol, 25 per cent.

Sig.: Drop a few drops into vagina with medicine dropper, two or three times a day.

Simple Vaginitis.

| | | |
|------------------------|---------|------|
| ℞ Alum, powdered | 1 ounce | 30\|0 |
|------------------------|---------|------|

Or:—

| | | |
|-----------------------|---------|------|
| ℞ Zinc sulphate | 1 ounce | 30\|0 |
|-----------------------|---------|------|

Or:—

| | | |
|---------------|---------|------|
| ℞ Borax | 1 ounce | 30\|0 |
|---------------|---------|------|

Sig.: A tablespoonful to a quart of water, to be used as a vaginal injection three or four times a day. Apply a sterile pad of cheese-cloth. A fresh pad to be applied after each irrigation.

Catarrhal Vaginitis.

With a medicine dropper drop 3 drops of a 1 per cent solution of nitrate of silver into the vagina. Wait three days. Note the effect. If there is no improvement repeat. As a rule such children are subnormal and require $\frac{1}{2}$ to 1 dram of Basham's mixture three times a day. If there is emaciation give codliver oil as a restorative.

Bladder Weakness.

Strychnine $\frac{1}{100}$ grain, gradually increased to $\frac{1}{75}$ and $\frac{1}{50}$ grain, three times a day.

Enuresis.

| | | |
|--------------------------------|-----------|--------------|
| ℞ Ext. rhus aromaticæ fl. | 10 minims | gtts. 10\|0 |
| Syrupi aromatici | 20 minims | gtts. 20\|0 |
| Aquæ destillatæ .....q. s. ad | 1 dram * | q. s. ad 4\|0 |

Sig.: This amount to be given three times a day.

Or:—

For a child three years old. An infant one-half the dose.

| | |
|--------------------------|---------|
| ℞ Atropia sulphate | 1 grain |
| Aqua | 1 ounce |

Sig.: Begin with 1 drop, three times a day. Increase 1 drop daily until 5 drops are taken three times a day. If no improvement follows after one week, give 6 drops three times a day, and increase every three days until 10 drops three times a day, are given.

The pupils should be watched, likewise the pulse and respiration, and if any symptoms of atropine are noted, discontinue the drug. In some instances atropia can be given one day and strychnine $\frac{1}{60}$ grain given three times a day on the alternate days.

Nephritis.

| | | |
|------------------------|-------------------|----------------|
| ℞ Potass. citrat. | 2½ drams | 10\|0 |
| Ext. buchu fl. | 2½ drams | 10\|0 |
| Ext. uva ursi fl. | 1 dram, 1 scruple | 5\|0 |
| Syr. limonis | 2 ounces | 60\|0 |
| Aquæ .....q. s. ad | 4 ounces | q. s. ad 120\|0 |

M. Sig.: Teaspoonful every two or three hours.

Loss of Appetite after Exhaustive Disease.

One-half dram rhubarb and soda before meals. Liquid diet for three days. Then give Basham's mixture, $\frac{1}{2}$ dram with water, after meals.

Tonic after Exhaustive Disease, such as Pneumonia or Summer Diarrhea.

| | | |
|-------------------------|----------|----------------|
| ℞ Ferri pyrophos. | 1 dram | 4\|0 |
| Quininæ sulph. | ½ dram | 2\|0 |
| Strych. sulph. | ¼ grain | 0\|015 |
| Acid. phosph. dil. | 2 drams | 8\|0 |
| Aquæ .....q. s. ad | 4 ounces | q. s. ad 120\|0 |

M. Sig.: Teaspoonful three times a day.

Tonic and Restorative.

| | | |
|---------------------------------|----------|---------------|
| ℞ Ferri et quininæ citrat. | ½ dram | 2\|0 |
| Syr. hypophos. comp. | 4 drams | 16\|0 |
| Aquæ .....q. s. ad | 2 ounces | q. s. ad 60\|0 |

M. Sig.: Teaspoonful after each meal.

Tonic During Chorea..

| | | | |
|----|--|-------------------|---------------|
| R | Liq. potass. arsenitis | ½ dram | 2\|0 |
| | Ferri et ammon. citrat. | 1 dram | 4\|0 |
| | Aquæ | q. s. ad 2 ounces | q. s. ad 60\|0 |
| M. | Sig.: Teaspoonful three times a day. Increase gradually. | | |

Persistent Vomiting.

Lavage (stomach washing) with one tablespoonful of salt to a quart of warm water (100° F.). Then leave stomach rest at least six hours.

Rectal Feeding.

When it is difficult to feed by mouth owing to excessive vomiting or where intubation has been performed, we can resort to rectal feeding.

The colon should be washed with one pint of soap water, and fifteen minutes after the colon has been emptied, peptonized milk or the yolk of raw egg, added to starch water may be injected every four to six hours. The colon washing should be done twice a day.

Loose Bowels.

Give 2 drams of castor oil. Three hours later give a colon irrigation of 1 quart saline solution. The diet should consist of fat-free or skimmed milk. In the larger cities we can procure protein milk from the laboratories, and use the same quantity as given prior to the bowel condition.

An older child may have cornstarch, rice and tapioca pudding.

Entero-colitis.

| | | | |
|----|--------------------------------------|-------------------|---------------|
| R | Tinct. kino | 20 minims | gtts. 20\|0 |
| | Misturæ cretæ comp. | 1 dram | 4\|0 |
| | Aqua | q. s. ad 2 ounces | q. s. ad 60\|0 |
| M. | Sig.: Teaspoonful every three hours. | | |

Colitis, with Pain.

| | | | |
|----|------------------------------------|------------------|---------------|
| R | Tinct. opii camph. | 10 minims | gtts. 10\|0 |
| | Bismuthi subnit. | 2 grains | 0\|12 |
| | Aquæ calcis | q. s. ad 4 drams | q. s. ad 16\|0 |
| M. | Sig.: Teaspoonful every two hours. | | |

Gastro-enteritis.

℞ Castor oil.

Teaspoonful every two hours, for four doses.

If diarrhea persists after flushing the colon and washing the stomach, give the following:—

℞ Cerium oxalate or bismuth subnitrate.

Sig.: 5 grains every three hours.

The diet is most important.

Summer Diarrhea.

℞ Calomel tablets $\frac{1}{10}$ grain 0|006

Sig.: One every twenty minutes for three doses.

For a child 1 to 2 years old.

Followed by:—

℞ Mist. rhei et soda 2 ounces 30|0

Sig.: Teaspoonful every hour, for three doses.

Following day give:—

℞ Bismuth betanaphthol.

Sig.: 5 grains, in water, every two hours.

Or:—

℞ Mist. creta.

Sig.: Teaspoonful every two hours.

Or:—

℞ Bismuthi subnit. 20 grains 1|2

Misturæ cretæ comp. 4 drams 16|0

Aquæ q. s. ad 2 ounces q. s. ad 30|0

M. Sig.: Teaspoonful every two hours.

Or:—

℞ Tannalbin or tannigen.

Sig.: 5 to 10 grains every three hours.

Persistent Diarrhea, with Tuberculous Symptoms.

℞ Guaiacol carbonate.

Sig.: 1 to 2 grains three times a day.

For a child 1 year old.

Atonic Dyspepsia, with Constipation.

| | | |
|---|-------------------|---------------|
| ℞ Tinct. nucis vomicæ | 15 minims | gtts. 15\|0 |
| Pulv. rad. ipecacuanhæ | 1 grain | 0\|06 |
| Pulv. rad. rhei | 10 grains | 0\|6 |
| Sodii bicarbonas | ½ dram | 2\|0 |
| Aquæ | q. s. ad 2 ounces | q. s. ad 30\|0 |
| M. Sig.: Teaspoonful before each feeding. | | |

Intestinal Obstruction.

Always make a rectal examination. Intestinal obstruction may be caused by an intussusception but also by a neoplasm involving the kidney, the ovary (ovarian cyst), and acute appendicitis with abscess.

Irritated Skin.

Inflammation and eruptions of the skin are frequently caused by the use of irritating soaps. Castile, or superfatted soaps are best adapted for delicate skins.

Herpes Labialis Associated with Acute Indigestion.

(Child one year old.)

| | |
|-------------------|----------|
| ℞ Calomel | ¼ grain |
| Soda bicarb. | 5 grains |

Sig.: Repeat every fifteen minutes. Give five doses.

Then give:

℞ Mist. rhubarb and soda.

Sig.: One dram every hour for three doses.

Urticaria—Hives.

To stop itching:—

| | | |
|---------------|--------------|--------|
| ℞ Resorcin, | | |
| Menthol, | | |
| Phenol | āā 15 grains | āā 1\|0 |
| Alcohol | 7 ounces | 200\|0 |

M. Sig.: Apply with cotton.

Or:—

Apply bicarbonate of soda paste.

| | |
|---------------------|--------|
| ℞ Soda bicarb. | 1 dram |
| Water | ½ dram |

M. Sig.: Rub into each herpetic eruption, every hour until improvement is noted.

Internally, if acetone and diacetic acid is found in the urine, give 1 dram soda bicarb. every hour until improvement is noted.

Scabies.

| | | |
|---------------------|-----------|------|
| R Balsam Peru | 1 dram | 4\|0 |
| Sulphur | ½ dram | 2\|0 |
| Betanaphthol | 10 grains | 0\|6 |
| Petrolatum | 1 ounce | 30\|0 |

M. Sig.: Apply on affected areas. Repeat three successive nights.

Milk Crust on Scalp.

| | | |
|----------------------|---------|------|
| R Olive oil | ½ ounce | 15\|0 |
| Castor oil | ½ ounce | 15\|0 |
| Salicylic acid | ½ dram | 2\|0 |

M. Sig.: Apply every six hours until the crusts loosen.

Burns.

R Picric acid ointment, 1 per cent.

Sig.: Apply thickly and cover with strips of oiled silk, then sterile gauze and bandage.

Eczema.

Cooling lotions:—

| | | |
|----------------------|-----------|------|
| R Pulv. calami | ½ dram | 2\|0 |
| Pulv. zinci ox. | ½ dram | 2\|0 |
| Glycerini | 15 grains | 1\|0 |
| Aq. calcis | 1 ounce | 30\|0 |

M. Sig.: Apply three times a day.

Or:—

| | | |
|--------------------------------|-------------------|----------------|
| R Phenol | 20 drops | gtts. 20\|0 |
| Zinc. oxid. | 3 drams | 12\|0 |
| Calamine | 2 drams | 8\|0 |
| Glycerini | 4 drams | 16\|0 |
| Liq. plumbi subacet. dil. | 1 ounce | 30\|0 |
| Lime-water | q. s. ad 6 ounces | q. s. ad 180\|0 |

M. Sig.: Apply three times a day.

To stop itching:—

| | | |
|--------------------|---------|------|
| R Zinc oxide | 2 drams | 8\|0 |
| Amylum | 2 drams | 8\|0 |
| Naphtalin | 1 ounce | 30\|0 |

M. Sig.: Apply at night.

Or Unna's soft zinc paste:—

℞ Ol. lini,
Aq. calcis,
Zinci ox.,
Cretæ of each, equal parts.

M. Sig.: Apply at night.

Eczema Rubrum.

Salicylic-sulphur paste:—

| | | |
|---------------------|-------------------|------|
| ℞ Ac. salicyl. | 15 grains | 1\|0 |
| Sulph. depur. | 1 dram, 1 scruple | 5\|0 |
| Petrolati | 6 drams | 25\|0 |
| Zinci oxidi | 2½ drams | 10\|0 |
| Amyli | 2½ drams | 10\|0 |

M. Sig.: Apply three times a day.

Ichthyol ointment:—

| | | |
|----------------------------------|-------------------|------|
| ℞ Ammon. sulph. ichthyolat. | 1 dram, 1 scruple | 5\|0 |
| Aq. dest. | 1 dram, 1 scruple | 5\|0 |
| Adeps benzoat. | ½ ounce | 15\|0 |
| Adeps lanæ | 6 drams | 25\|0 |

M. Sig.: Apply three times a day.

Erysipelas and Cellulitis.

| | | |
|---------------------------|-----------|-------|
| ℞ Magnesia sulphate | 2 drams | 8\|0 |
| Aquæ | 16 ounces | 500\|0 |

M. Sig.: Apply as a lotion.

Erysipelas.

Streptococcus vaccine, 50,000,000 to 100,000,000. Injected hypodermically.

Bacterial Vaccines.

Vaccine treatment for erysipelas, pertussis, typhoid, and pneumonia, will be found on pages 577-581.

Mouth-wash.

℞ Pulv. acid. boric solution, 1 per cent.

Stomatitis or Aphthæ.

℞ Solut. kali permangan., 1 per cent.

Sig.: Dilute with equal parts warm water. Wash three times a day.

Or:—

R Phenol 5 minims
 Glycerine 1 ounce

Sig.: Apply thoroughly.

Or:—

R Soda bicarb. 1 dram
 Water $\frac{1}{2}$ dram

Sig.: Apply thoroughly as paste, every hour.

Hookworm.

R Eucalyptus oil 2 drops gtts. 2|0
 Chloroform 1 drop gtt. 1|0
 Castor oil 2 drams 8|0

M. Sig.: One dose t. i. d. Repeat treatment several days.

Tapeworm.

R Chloroform 10 drops gtts. 10|0
 Oleores. filis mas $1\frac{1}{2}$ drams 6|0
 Syr. ginger q. s. ad 1 ounce 30|0

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